Biology

6.6A MARINE BIOLOGICAL RESOURCES

This section evaluates the marine biological resources at and in the vicinity of the Morro Bay Power Plant (MBPP) and the effects of the Project on those resources. This evaluation addresses requirements of many federal and state laws, ordinances, and standards. Findings from current intake and discharge studies will form the basis for renewal of the plant's National Pollutant Discharge Elimination System (NPDES) permit issued by the Regional Water Quality Control Board (RWQCB). Terrestrial tropical resources are evaluated in Section 6.6B of this Application for Certification (AFC).

The section also provides current information on the existing habitats gathered from studies conducted in the vicinity of the MBPP as required by the California Energy Commission's (Commission) AFC process and discusses the potential effects of the modernization Project on the biological resources.

The MBPP is an existing power production facility that has been in operation since the early 1950s. During its 50-year operation, extensive environmental monitoring has occurred, and no significant impacts to biological resources or to beneficial uses have been reported from operation of the plant. The RWQCB permitted and continuously reviewed (every 5 years) the existing facility's cooling water system intake and discharge by issuance of a NPDES permit. Results of these 5-year reviews by the RWQCB have repeatedly found that the cooling water intake system (CWIS) represents best technology available and that the discharge protects the receiving water's beneficial uses. As required by the RWQCB, the applicant has repeated a number of previous studies relevant to the issuance of a new NPDES permit. These contemporary studies are focused on issues of potential discharge effects in Estero Bay and the impingement and entrainment of Morro Bay marine at the facility's intake. The year-long impingement study has been completed as well as 9 months of the planned 12-month entrainment study. Results from all of these recent studies have been incorporated in this sections impact assessment of the project's reduced intake and discharge volumes.

The evaluation presented in this section responds to requirements of the Federal Clean Water Act Sections 316(a)[1][2] and (b),[3] the State Thermal Plan,[4] the Ocean Plan,[5] the Endangered Species

(1) Section 316(a); 33 United States Code (USC) §1326 - Thermal Discharges. The administering agency for the above authority is the Central Coast RWQCB with oversight provided by U.S. Environmental Protection Agency (EPA) Region IX.

(2) Section 402; 33 USC §1326; 40 Code of Federal Regulations (CFR) Part 316(a). This federal permit requirement is administered by the Central Coast RWQCB, with oversight provided by EPA Region IX.

(3) Section 316(b); 33 USC §1326 – Cooling Intake Structures. The administering agency for the above authority is the Central Coast RWQCB with oversight provided by EPA Region IX.

(4) Water Quality Control Plan for Control of Temperature in Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan), Appendix A-3. The plan was established in conjunction with 40 CFR 316(a) for thermal discharges. It is administered by the Central Coast RWQCB.

Act,[6][7] the Migratory Bird Treaty,[8] the Coastal Zone Act,[9] and other laws,[10][11] regulations, ordinances, and standards (LORS).

Biological Benefits of the Modernization Project

Use of the existing MBPP as the site for the Project presents significant opportunities to avoid impacts to biological resources normally associated with use of a greenfield location. This is because MBPP is an existing active industrial site, onsite habitats are highly disturbed, and onsite biological resources are minimal. In addition, this analysis reflects the results of studies of impacts on marine resources from ongoing operations that would be impossible to provide for a greenfield site. The power plant's existing discharge thermal plume has been extensively studied at peak power plant loads and varying receiving water conditions. Contemporary plume monitoring data (Section 6.5) and biological studies are used to verify the past studies and to project the benefits of the Project's reduced discharge on the distribution and dispersion of the discharge plume and associated thermal effects. Several key aspects discussed in this section demonstrate the benefits of the MBPP Project from the perspective of avoiding impacts to biological resources and include:

- An approximately 29 percent reduction in intake pump capacity directly reduces the entrainment effects of present operations. With its smaller volume, the modernized facility's discharge plume will mix more rapidly, become buoyant and separate from the ocean bottom in a shorter distance from the point of discharge. As a result of its smaller size, the modernized facility's thermal plume will contact less linear distance of shoreline than the historical plume present when past biological impact assessments were conducted.
- The Project's slower intake velocities will reduce the risk of impinging organisms on the intake screens.

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(5) California Water Code §13269; 23 California Code of Regulations (CCR) Chapter 9. Clean Water Act §402(p) and implementing regulations at 40 CFR Parts 122 seq., as administered by the Central Coast RWQCB. The administering agency for the above authority is the Central Coast RWQCB.

(6) Endangered Species Act of 1973; 16 USC §1531 et seq.; 50 CFR Parts 17 and 222. The administering agency for the above authority for terrestrial and avian species is the United States Fish and Wildlife Service (USFWS).

(7) California Endangered Species Act of 1984; California Fish and Game Code §2050-2098. Animals of California declared to be endangered or threatened are listed at 14 CCR §670.5. The administering agency for the above authority is the California Department of Fish and Game (CDFG).

(8) Migratory Bird Treaty Act; 16 USC §703-711; 50 CFR Subchapter B. The administering agency for the above authority is the USFWS.

(9) California Coastal Act of 1976. The administering agency is the California Coastal Commission.

(10) California Porter-Cologne Water Quality Control Act 1972; California Water Code §13000-14957; Division 7, Water Quality. The Project will comply with the regulations set forth in this act. The administering agency for the above authority is the Central Coast RWQCB.

(11) California PRC §25523(a); 20 CCR §1752, 1752.5, 2300-2309, and Chapter 2, Subchapter 5, Article 1, Appendix B, Part (I). The administering agency for the above authority is the Commission, with comment provided by CDFG.

- The Project's smaller discharge will further reduce the potential risk of the discharge coming back onshore south of Morro Rock and entering Morro Bay. The results of past MBPP thermal plume studies demonstrate the absence of any possible thermal effects on Morro Bay habitats. Current thermal plume dispersion studies temperature monitoring data verify these past findings.
- The Project's smaller discharge will further reduce the potential risk of temperature effects from the discharge on the area's subtidal habitats (benthos). Because the Units 1 through 4 thermal plume is primarily a surface phenomena, benthic habitat deeper than 5 meters (16 feet) is not contacted beyond the discharge area. Moreover, prior studies of the benthos found no significant impact on this habitat under similar plume conditions to that projected for the Project. These earlier findings are being updated by a contemporary (September 2000) resurvey of the sites.
- The Project's existing NPDES intake finding of Best Technology based on previous impingement studies is confirmed by the results of the completed 1999-2000 impingement studies. Few differences were found between the species composition of impinged fishes collected in the late 1970s and today, based on the results of recent 1999-2000 surveys. Results of contemporary surveys of the facility's CWIS impingement are used in comparison to these past surveys and used to project impacts of the modernized facility's CWIS.
- Use of the existing once-through cooling water intake and discharge structures at MBPP avoids new construction-related impacts to aquatic resources. The facility's once-through cooling water system also returns organisms that are entrained and impinged to the receiving water. The entrainment study (316(b) Resource Assessment Study) is designed to evaluate potential effects of the CWIS on populations as a part of the NPDES permit.
- Use of state-of-the-art combined-cycle technology for the Project reduces design seawater intake volumes and approach velocities through the existing intake structures as part of the Project, thereby reducing entrainment losses by an estimated 29 percent or more, depending on operating mode, and minimizing impingement rates of juvenile and adult fishes and shellfish.

Marine Biology

Information to conduct an assessment of Project impacts on marine biological resources for the AFC is available in a wide range of specific MBPP impact studies, some more recent than others. Without losing the valuable information from previous MBPP impact studies, a Technical Working Group (TWG) of regulatory agency representatives and independent scientists decided that contemporary studies should be conducted. Under the direction of the Project's TWG representing the Commission, the RWQCB, the CDFG, and the California Coastal Commission, studies of the intake and discharge were designed and undertaken. These studies were designed to update baseline conditions, verify previous findings and conclusions, and provide information to be used for issuance of the Project's

NPDES permit. The study plan developed to evaluate the modernized facility's potential intake effects is attached as Appendix 6.6A-1 (Cooling Water Intake Study Plan). The study plan describing the thermal plume characteristics and biological thermal effects studies conducted in the vicinity of the plume are included in Appendix 6.5-1 (Thermal Discharge Study Plan).

A large body of information regarding the marine resources that might be affected by the Project has been collected in intensive field surveys over the past 15 months. Findings of these contemporary studies complete an update of previous marine habitat and resource assessments within a mile of the Project and provide an adequate basis to assess potential cooling water system (CWIS) impacts of the modernized MBPP. Categorically, the impacts of the Project's proposed CWIS are those impacts associated with the intake of seawater for heat exchange and the discharge of the heated seawater. Details of the CWIS intake and discharge facility descriptions, the volumes of cooling water withdrawal and discharge, and discharge water quality, particularly temperature, are presented in Chapter 2.0 - Project Description and Section 6.5 - Water Resources.

Recent studies of the effects of the cooling water system have been completed or are well underway. A 12-month impingement study was completed on September 8, 2000 and a year-long entrainment study will be completed in early December 2000. A qualitative survey of the rocky intertidal area of Morro Rock was completed in August 1999 and a survey designed to assess the effects of the discharge was conducted in mid-September 2000. A sand beach fauna survey near the MBPP discharge was completed in August 2000, and subtidal benthic samples were collected in September 2000. A summary of recent and past aquatic biological resource studies conducted at or in the vicinity of the MBPP is shown in Table 6.6A-1. A map showing the locations of the algal, fish, and invertebrate study locations is presented as Figure 6.6A-1.

Power Plant Intake and Discharge

The existing and modernized MBPP intake and discharge systems are shown schematically in Figures 6.6A-2 and 6.6A-3, respectively. An elevation view of the shoreline intake structure is presented in Figure 6.6A-4. The peak cooling water intake and discharge water flows of the existing facility (464,000 gallons per minute [gpm]) are reduced by approximately 29 percent for the Project (330,000 gpm). The existing facility's maximum intake and discharge volume is somewhat less than the designed peak (490,000 gpm) due to degradation of the pumps (see Section 6.5 - Water Resources). The results of thermal discharge and intake impingement studies conducted during contemporary and past MBPP operations that were comparable to

TABLE 6.6A-1

AQUATIC RESOURCE STUDIES BY HABITAT TYPE CONDUCTED IN THE VICINITY OF THE MBPP

HABITAT TYPE	STUDY TYPE	TYPE OF SAMPLING CONDUCTED	SOURCE	DATE
Morro Bay				
Subtidal channels	Abundance and composition of fishes and invertebrates	Otter trawls	CDFG	1992-1999
	Abundance and composition of fishes	Otter trawls, seines, dip nets, hook and line, spearfishing	Fierstine	1968-1970
Intertidal mudflats	Abundance and composition of fishes	Bag seines	Horn	1974-1976
		Otter trawls, seines, dip nets, hook and line, spearfishing	Fierstine	1968-1970
Submerged aquatic vegetation	Abundance and composition of plant species	Vegetation Survey	Chestnut	1999
	Abundance and composition of fishes	Bag seines	Horn	1974-1976
Coastal salt marsh	Abundance and composition of plants	Vegetation Survey	Jarque	1998
Brackish marsh	Abundance and composition of plants	Vegetation Survey	Jarque	1998
Rocky intertidal/shallow subtidal	Habitat characterization	Intertidal algae and invertebrate surveys, bird surveys	SOCAL	1973
Open water	Intake effects on larval fishes and megalopal cancer crab	Entrainment and source water plankton tows	Tenera	June 1999-December 2000
	Intake effects on juvenile and adult fishes and macroinvertebrates	Impingement collections	Tenera	September 1999-September 2000
	Abundance and composition of fishes and invertebrates	Otter trawls	CDFG	1992-ongoing
	Intake effects on juvenile and adult fishes and macroinvertebrates	Impingement collections	PG&E	1978-1979

TABLE 6.6A-1

AQUATIC RESOURCE STUDIES BY HABITAT TYPE CONDUCTED IN THE VICINITY OF THE MBPP (CONTINUED)

HABITAT TYPE	STUDY TYPE	TYPE OF SAMPLING CONDUCTED	SOURCE	DATE
Estero Bay				
Sandy Beach Intertidal	Thermal Effects	Sand beach fauna surveys	Tenera	August 2000
	Habitat Characterization	Sand beach bird and fauna surveys	Dugan Minerals Management Services (NOAA)	1998-Ongoing
	Abundance and Distribution	Pismo clam surveys	CDFG	1945-Ongoing
	Habitat Characterization	Sand beach fauna surveys	SOCAL	1973
	Thermal Effects	Sand beach fauna surveys	Adams et al.	1971-1972
Sandy–Mud Subtidal	Thermal Effects	Subtidal benthic grab sampling and fish observations	Tenera	September 2000
	NPDES monitoring of benthic infauna	Subtidal benthic grab	Morro Bay/Cayucos Sanitary District	1985-ongoing
	Thermal Effects	Angler use and catch composition surveys	Steitz	1974
	Thermal Effects	Subtidal benthic grab sampling, otter trawls, and gill net sets	PG&E	1971-1972
Rocky Intertidal	Thermal Effects	Algal and invertebrate surveys and fish observations	Tenera	August 1999 and September 2000
	Thermal Effects	Angler use and catch composition surveys	Steitz	1974
	Habitat Characterization	Algal and intertidal surveys	SOCAL	1973
	Thermal Effects	Algal and invertebrate surveys and fish observations	PG&E	1972
	Thermal Effects	Algal and invertebrate surveys	North	1967-68
Rocky Subtidal	Thermal Effects	Algal and invertebrate surveys and fish observations	Tenera	August 1999 and September 2000
	Thermal Effects	Angler use and catch composition surveys	Steitz	1974
	Thermal Effects	Algal and invertebrate surveys and otter trawls and gill net fish surveys	PG&E	1972
	Thermal Effects	Algal and invertebrate surveys	North	1967-68
Kelp Beds(1)				
Open Water	Thermal Effects	Otter trawls and gill net fish surveys	PG&E	1972

(1) There are no kelp beds within the immediate vicinity of the MBPP. We did not find any studies of the kelp beds to the north of the MBPP.

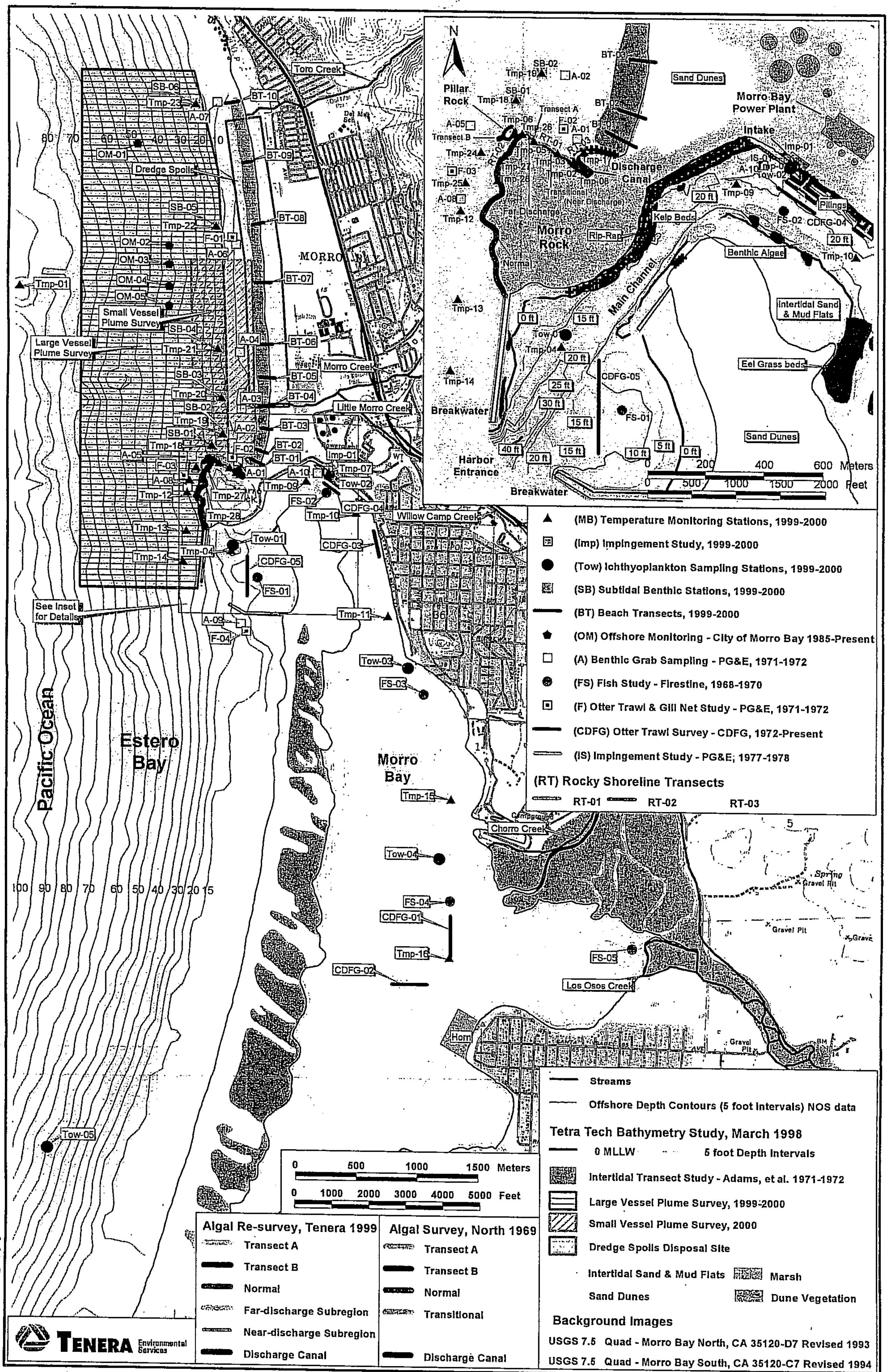


Figure 6.6A-1. Map of current and previous aquatic biological studies in the vicinity of the MBPP.

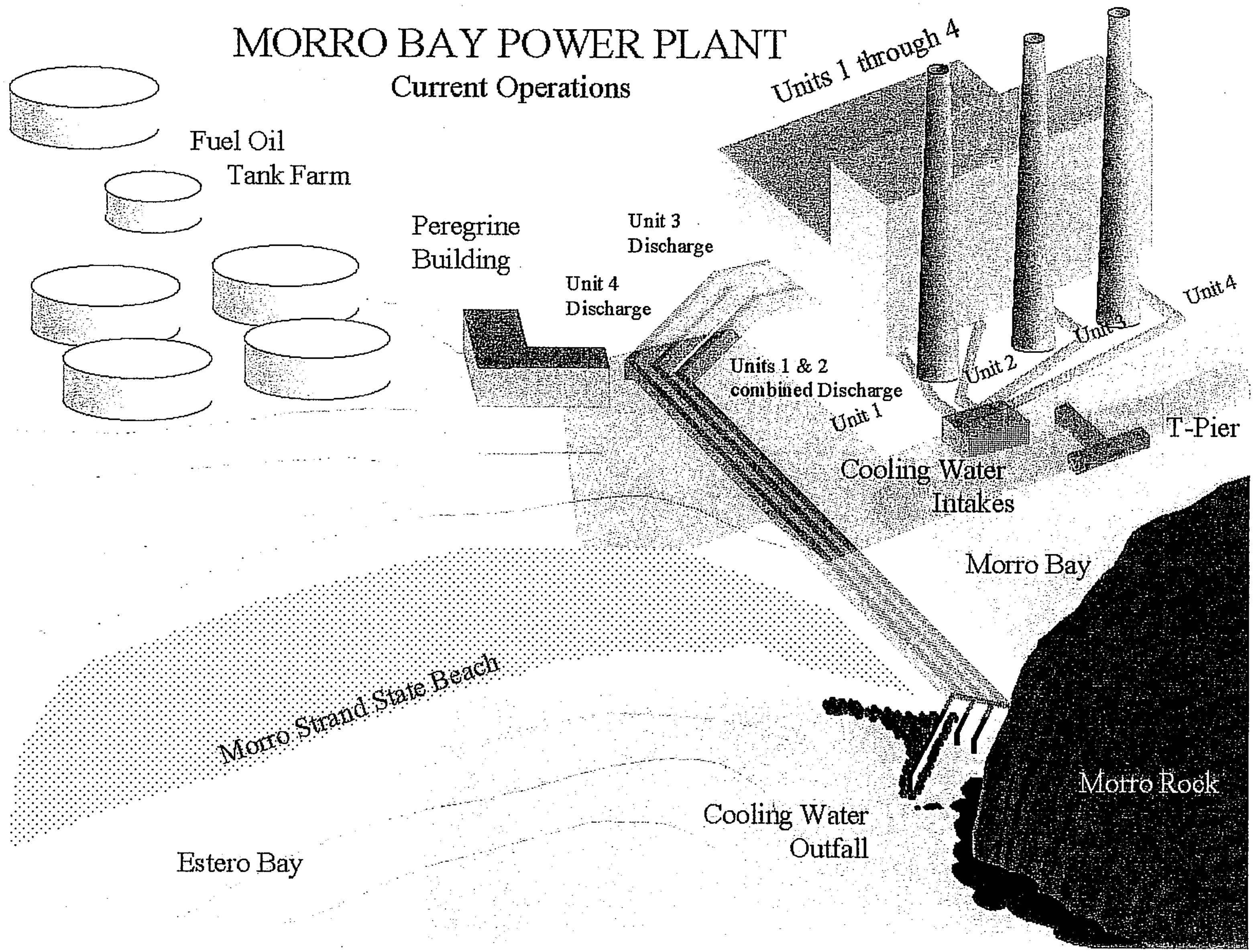


Figure 6.6A-2. Existing MBPP cooling water intake and discharge systems.

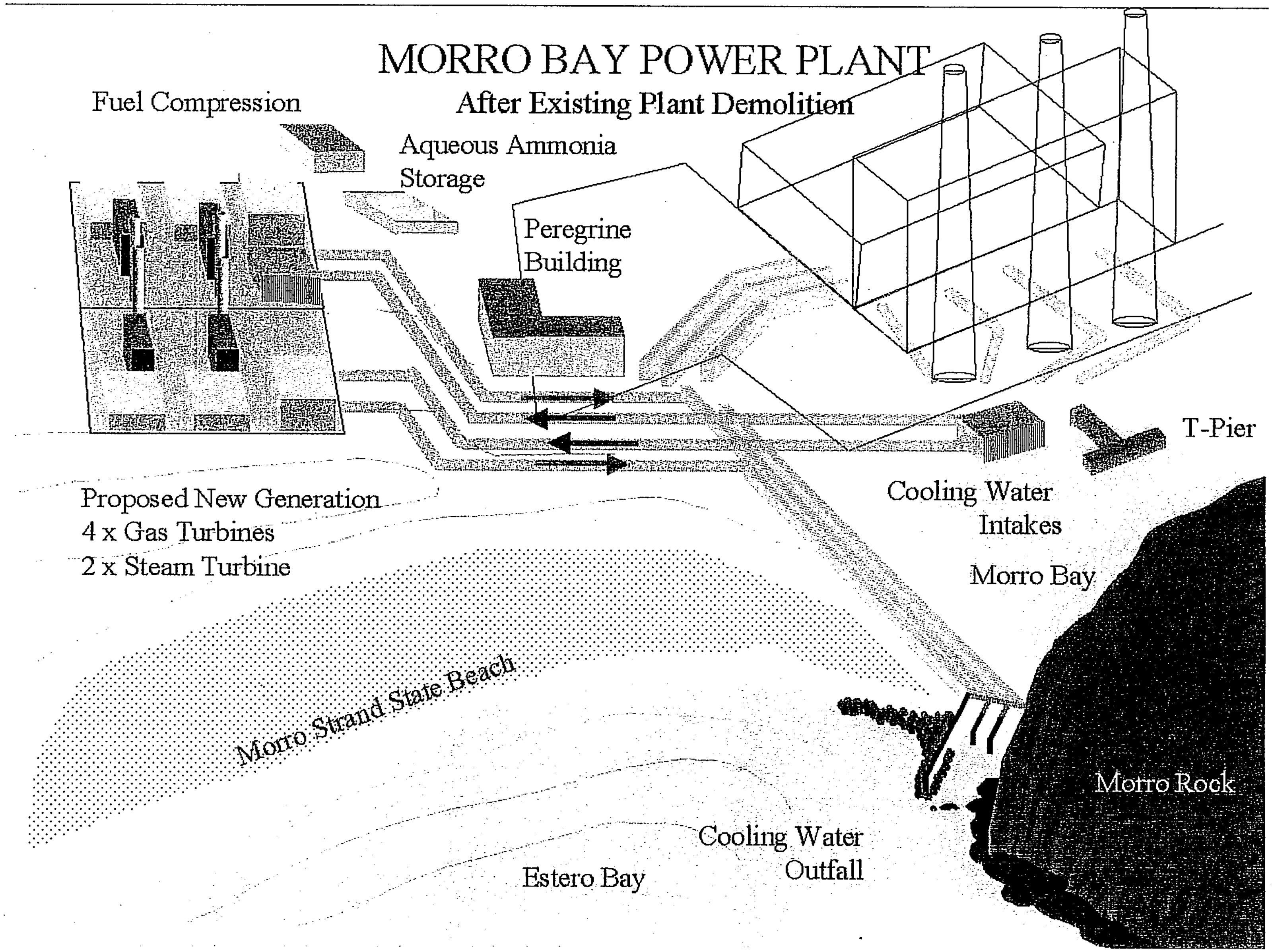


Figure 6.6A-3. Modernized MBPP showing the cooling water intake and discharge systems.

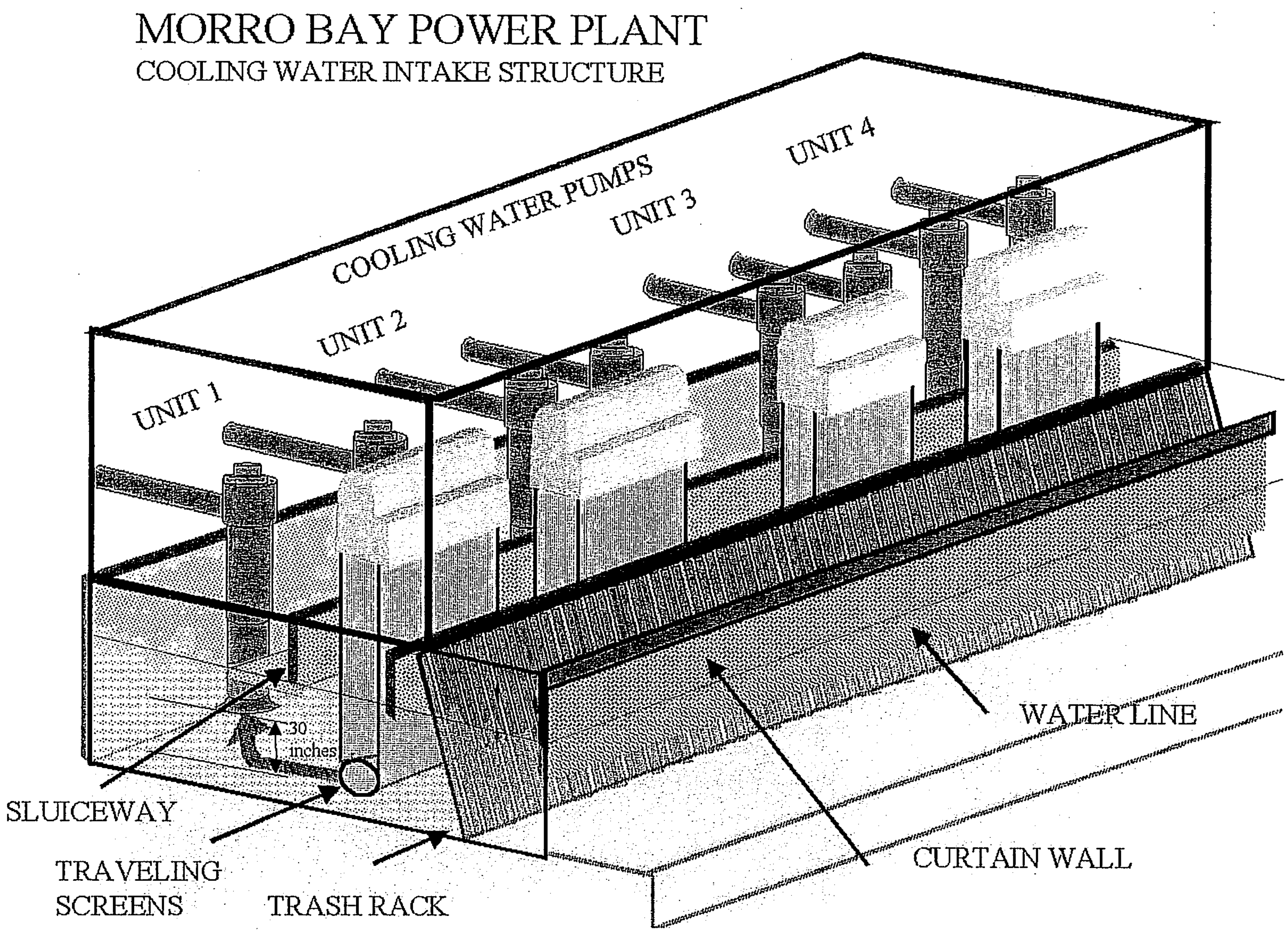


Figure 6.6A-4. MBPP intake structure (isometric view).

projected facility operations were used to assess and forecast modernized facility cooling water system impacts. The Project's reduced cooling water volume will entrain fewer larval fishes and shellfish than the existing facility and will also result in a smaller discharge plume that will reduce the potential thermal effects. The Project's lower intake approach velocities will reduce impingement rates.

CWIS impacts can potentially affect several different components of the MBPP Project's surrounding biological resources. The Project's CWIS will withdraw cooling water through the existing facility's two adjacent intake structures (Units 1 and 2 and Units 3 and 4; Figure 6.6A-3). Not only does the modernized facility significantly reduce design intake volume, the "approach to bar rack" velocities are also reduced (Section 6.5 - Water Resources). Designed approach velocities at the new combined-cycle unit during peak load and maximum water withdrawal conditions. This velocity meets current Federal recommendations for the design of intake velocities and is expected to further reduce impingement losses of the existing intake.

Even with this reduction in approach velocities, fishes and shellfish larger than the 3/8-inch screen mesh that are weak swimmers or otherwise unable to avoid the traveling screens will be impinged. Other smaller organisms, such as larval fishes and crabs, will be entrained through the screens in the cooling water flow. Entrained and impinged organisms are returned to Estero Bay through the discharge system.

The heated CWIS discharge creates a buoyant surface-plume of seawater that is carried by winds and currents north into Estero Bay. Although the volume of the discharge will be approximately 29 percent smaller than presently permitted, the thermal plume will still contact the shoreline beach and Morro Rock in the vicinity of the shoreline discharge structure (see Figures 6.5-20 through 6.5-24 in Section 6.5 - Water Resources). Previous studies have reported little to no effect of the power plant's thermal discharge on receiving water's fish and invertebrates populations. The more thermally sensitive species of attached algae along Morro Rock's shoreline have exhibited changes in species composition associated with warmed seawater temperatures, most notably in the immediate vicinity of the discharge structure. The extent of these existing discharge effects will be reduced by the modernized facility's relative reductions in discharge volume.

1999-2000 Intake Studies

Studies of the effects of the MBPP intake began in 1999. A 12-month (September 1999 to September 2000) survey of the numbers and kinds of organisms impinged at the existing MBPP intake has been completed. The study's results are summarized in AFC Section 6.6.A.2.1.1 and presented in Appendix 6.6A.2. The study's results are used in the AFC to both verify and update the findings of the 1977-1978 impingement impact assessment (PG&E, 1982) and assess potential impacts of the modernization Project's CWIS impingement impacts. Section 316(b) of the Clean Water Act requires that "...the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." Studies and evaluations of the MBPP Project's CWIS were designed to determine whether the proposed intake complies with Section 316(b) of the Clean Water Act. The determination of compliance involves an evaluation of whether the operation of the CWIS will result in an adverse environmental impact, and if so, what intake technologies are both available, feasible and cost effective in reducing impacts. Although the EPA has provided guidance (EPA, 1977) on the recommended methods and steps in the evaluation process, the experience and knowledge gained in the studies and preparation of numerous 316(b) evaluations are incorporated in the present study. The scientific approach and methods employed in the MBPP CWIS studies have been undertaken with the review and advice of the Project's TWG.

A 12-month survey of the species composition and concentration of organisms entrained began in June 1999 and will be completed in 2 months (early December 2000). After over 2 months of sampling, a 4-month lapse in the study occurred while a collection permit for tidewater goby was obtained from the USFWS. The findings from the completed 8 months of entrainment sampling are summarized in AFC Section 6.6A.2.1.1 and in Appendix 6.6A.3. The study's results as reported herein provide a thorough and nearly complete inventory of the species of fishes and cancer crabs entrained by the MBPP. The results are used to assess the potential CWIS effects of the modernized facility in terms of its designed reductions in cooling water volume, reduced approach velocities, and the composition and economic importance of species that are expected to benefit from the reductions.

Fishery population impact models are used to project potential CWIS entrainment and impingement impacts, and are based on contemporary operational field data. The projected 29 percent reduction in CWIS intake volume directly reduces the losses of entrained larval fishes as well reducing any indirect losses extrapolated to the adult populations.

1999-2000 Discharge Studies

Several contemporary studies were designed to examine potential thermal effects of the existing discharge plume, verify past thermal effects study data, and project the modernized plant's thermal effects. Morro Rock's marine habitat was resurveyed in August 1999 and September 2000 in the manner and methods employed in a 1969 thermal effects study by CalTech professor, Dr. Wheeler North. The results of the 1999 and 2000 resurveys are used to verify and update Dr. North's observations and to assess the potential benefits of the modernized facility's reduced discharge volume. The results of the resurveys are summarized in Section 6.6A.2.1.2 and a detailed report is attached as Appendix 6.6A-4. A resurvey of Estero Bay's Morro Strand State Beach (to the north of the MBPP discharge) was conducted on August 1 and 2, 2000 using the general approach employed in the Adams et al. (1974) study of the sand beach fauna potentially affected by the discharge. The study methods were updated and approved by the TWG (see Appendix 6.5-1 for Sand Beach Fauna Study Plan). A similar verification study of the shallow, subtidal benthos in the Estero Bay was designed and approved by the TWG to confirm and update the previously reported (PG&E, 1973) lack of thermal MBPP discharge effects (see Appendix 6.5-1 for Subtidal Benthic Study Plan). Results from the study will be used to project the potential for the modernized facility's reduced discharge volume to mitigate any existing discharge effects on the receiving water's subtidal habitat.

6.6A.1 AQUATIC RESOURCES

The MBPP is located at the intersection of three distinct geographic features: open coast, enclosed bay and tidal lagoon, and their unique habitats. Estuarine and lagoon habitats are found within the boundaries of Morro Bay, and Estero Bay is distinctly marine. Provided in the following sections are summary descriptions of estuarine and marine habitats, including the associated plant and animal species of sandy subtidal areas, intertidal mudflats, submerged aquatic vegetation, coastal salt marsh, brackish marsh, rocky intertidal areas, open water nekton and plankton.

6.6A.1.1 Morro Bay

Cooling water for the MBPP is drawn from Morro Bay through a common intake structure located just under a mile from the entrance to Morro Bay. Morro Bay is a shallow estuary, approximately 4.3 miles (6.9 kilometer) long and 1.8 miles (2.9 km) wide. Morro Rock, a 578-foot-tall (176 m) stone monolith which marks the entrance to the bay and harbor, dominates the bay's landscape and is visible from any point in Estero Bay and the surrounding coastal plain.

Two breakwaters form the entrance to the bay. The first extends 1,800 feet (549 meter) in a south-southwesterly direction from the base of Morro Rock. The second extends a similar distance to the west from the northern terminus of the sand spit that separates Morro Bay from Estero Bay. The ends of the breakwaters are separated by approximately 800 feet (244 m). A boat channel is maintained by the U.S. Army Corps of Engineers (COE) from the bay's entrance to White Point, a distance of approximately 2.5 miles. The channel is dredged every 3 to 4 years to a nominal depth of 15 feet (4.6 m) below Mean Lower Low Water (MLLW) (COE, 1997). A network of natural channels also extends throughout much of the back bay. The channels vary in depth from about 2 feet to more than 30 feet below MLLW and ultimately drain into the main boat channel.

Morro Bay receives freshwater input from the seasonally variable drainage flows of Chorro and Los Osos creeks. Total watershed of the creeks encompasses approximately 48,000 acres. At high tide the bay contains 2,100 acres of surface water. At low tide, surface water is reduced to 650 acres, and 980 acres of tidal mud flat and 470 acres of salt marsh are exposed (Gerdes et al., 1974).

The rate of tidal exchange of water in Morro Bay, as described in Section 6.5.1.4.1-Tidal Prism and in Appendix 6.5-3, varies as a function of distance from the mouth of the bay as shown in Figure 6.6A-5. For those species of Morro Bay fish and invertebrates with planktonic larvae, these differences in tidal exchange rates mean that larvae in the bay's lower reaches are approximately 15 times more likely to be transported out of the bay during medium streamflow (Tetra Tech, 1999) than larvae in the uppermost reaches. The lower rates of exchange in the upper bay provide several days of additional residency for these bay larvae before they are transported by tidal action out of their adult habitat. This tidal delay in the transport of planktonic larvae from the upper bay effectively reduces the risk of their entrainment near the harbor entrance and shifts any potential entrainment effects to populations residing in the lower bay and open ocean.

Morro Bay is a highly modified boating and marina harbor (see Section 6.5.1.4.1 - Navigational Development). Before dredging began, a coastal lagoon would normally form during the summer and fall where the present-day opening is located. It is also during this season that many of Morro Bay's resident goby species spawn possibly to take advantage of the normally closed or reduced open ocean circulation. The species found in the bay today, as well as their spawning patterns, may reflect the dramatic modification of Morro Bay tidal circulation from dredging activities. Dredging of these bay channels and the marina continue to maintain the modifications to the bay's many marsh and shallow water habitats. However, the delayed residence time of the back bay may also continue to provide an extended period of larval development that may be significant to their ability to avoid tidal transport to open ocean conditions via the harbor's entrance or the MBPP.

Morro Bay has been designated a State and National Estuary. The bay became part of the National Estuary Program (NEP) in 1995. The National Estuary Program was established in 1987, by amendments to the Clean Water Act (CWA), to identify, restore, and protect the nationally significant estuaries of the United States. The Morro Bay NEP has made significant in bringing

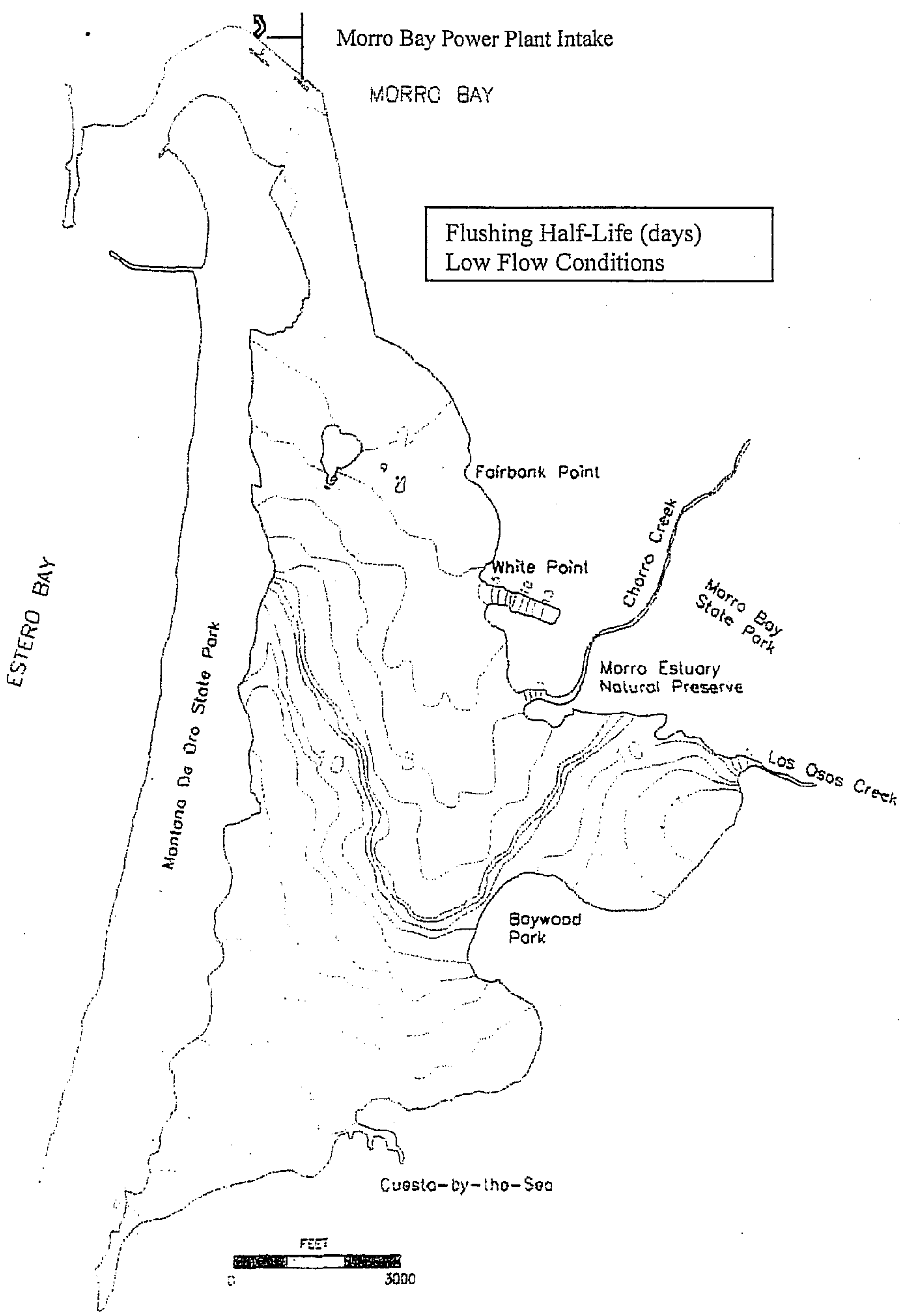


Figure 6.6A-5. Morro Bay EFDC model flushing analysis under low flow conditions. (After Tetra Tech 1999)

into focus changes needed both in planning and policy to protect the bay's future, particularly with regard to watershed management practices. The NEP has directed research aimed at gathering scientific on important information on sediment processes and of resource trends. NEP research may also include demonstration studies of interaction between watershed management and the bay's ecological processes.

6.6A.1.2 Morro Bay Resources

Dominant ecological communities in Morro Bay are intertidal mud flats, eelgrass beds, and a coastal salt marsh. The location and extent of these types of Morro Bay habitats are illustrated in Figure 6.6A-6. An overview map showing the habitats within a 1-square mile radius of the MBPP and individual habitat maps created at a 1:6,000 scale are shown in Figures 6.6A-7 and 6.6A-8a–i. The bay also contains habitats consisting of sandy subtidal, rocky intertidal (including areas created by the breakwater, wharves and pilings), and brackish marshes. Most of these habitats support aquatic vegetation. The estuary also accommodates a sizable commercial shellfish lease.

The Morro Bay habitats map (see Figure 6.6A-6) was produced on Arcview 3.1 using a variety of information sources. Digitized United States Geologic Survey (USGS) background data were fitted to a coastline obtained from the CDFG (Coast 24). Black and white habitat images scanned from the Natural Resources of Morro Bay (Gerdes et al., 1974) were sized to fit the coastline and overlaid on the background image. A theme was created for each habitat type by tracing around the area occupied by each habitat (using a "stream" extension for geographical information systems [GIS] mapping) and assigning a specific color. Marine mammal haul-out areas were mapped from field observations (CDFG unpublished data).

Other studies and data have been compiled from the available literature to provide background information specific to Morro Bay's aquatic resources. The CDFG initiated a long-term study of the Morro Bay estuary beginning on April 1992. (Locations identified in Figure 6.6A-9, Map of Previous Marine Biological Study Locations.) The primary focus of the study is to monitor the abundance of adult and juvenile fish species important to the area's commercial and recreational fisheries. Data from these otter trawls have been analyzed and are discussed in Appendix 6.6A-5. Two fishery studies were conducted in the late 1960s and early 1970s and provide valuable information on the species composition and abundance of fishes in Morro Bay. These two studies are summarized below.

6.6A.1.2.1 Diel and Seasonal Variation in Abundance and Diversity of Shallow Water Fish Populations in Morro Bay, California - Horn, 1980

Dr. Alex Horn of Cal Poly studied the diel (24-hour) and seasonal variations in species abundance, composition, and diversity of the shallow water fish community within Morro Bay. Because Morro Bay was considered to be subject to low levels of environmental stress, total species diversity was expected to be high. The study also compared Morro Bay total diversity and seasonal similarity values with the findings of three other studies conducted in similar California estuaries.

The site chosen for Horn's study was a shallow area of tidal flats and channels (considered typical bay habitat) adjacent to the western side of Baywood Point (Figure 6.6A-10). The bottom substrate was composed of mud/sand and covered with beds of eelgrass *Zostera marina*, and algal species *Gracilaria* spp. and *Ulva* spp. Water depth in sections of the study area reached 2 m (7 feet) at high tide. Samples were collected every 3 hours during a 24-hr survey in November 1974, May and August 1975, and February 1976. Captured fishes were identified, sorted, measured (standard length in mm), and weighed (grams [g]).

The 36 seine hauls (all four sampling periods) collected 11,627 fishes (197,747 g) representing 21 species. Three species, topsmelt *Atherinops affinis*, shiner perch *Cymatogaster aggregata*, and Pacific staghorn sculpin *Leptocottus armatus* composed nearly 82 percent (number of individuals) of the fishes collected. Gray smoothhound *Mustelus californicus*, jacksmelt, shiner perch and Pacific staghorn sculpin accounted for nearly 91 percent of the total biomass collected. Nearly equal numbers of species were collected during the day (14) and night (15) for all sampling periods combined, however, substantially greater numbers of individuals and biomass were collected during sampling efforts at night. Differences between the night and day sampling efforts showed greater percent similarity values for numbers of fish (68.5 percent) than for fish biomass (43.3 percent).

Four species (topsmelt, shiner perch, Pacific staghorn sculpin, and gray smoothhound) were the most abundant fishes sampled (Table 6.6A-2). The most abundant species was topsmelt (31 percent). The highest number of individuals was collected in May; the lowest levels were caught in August. Species diversity' was highest for numbers of individuals in May. Biomass was the highest in November and the lowest in February.

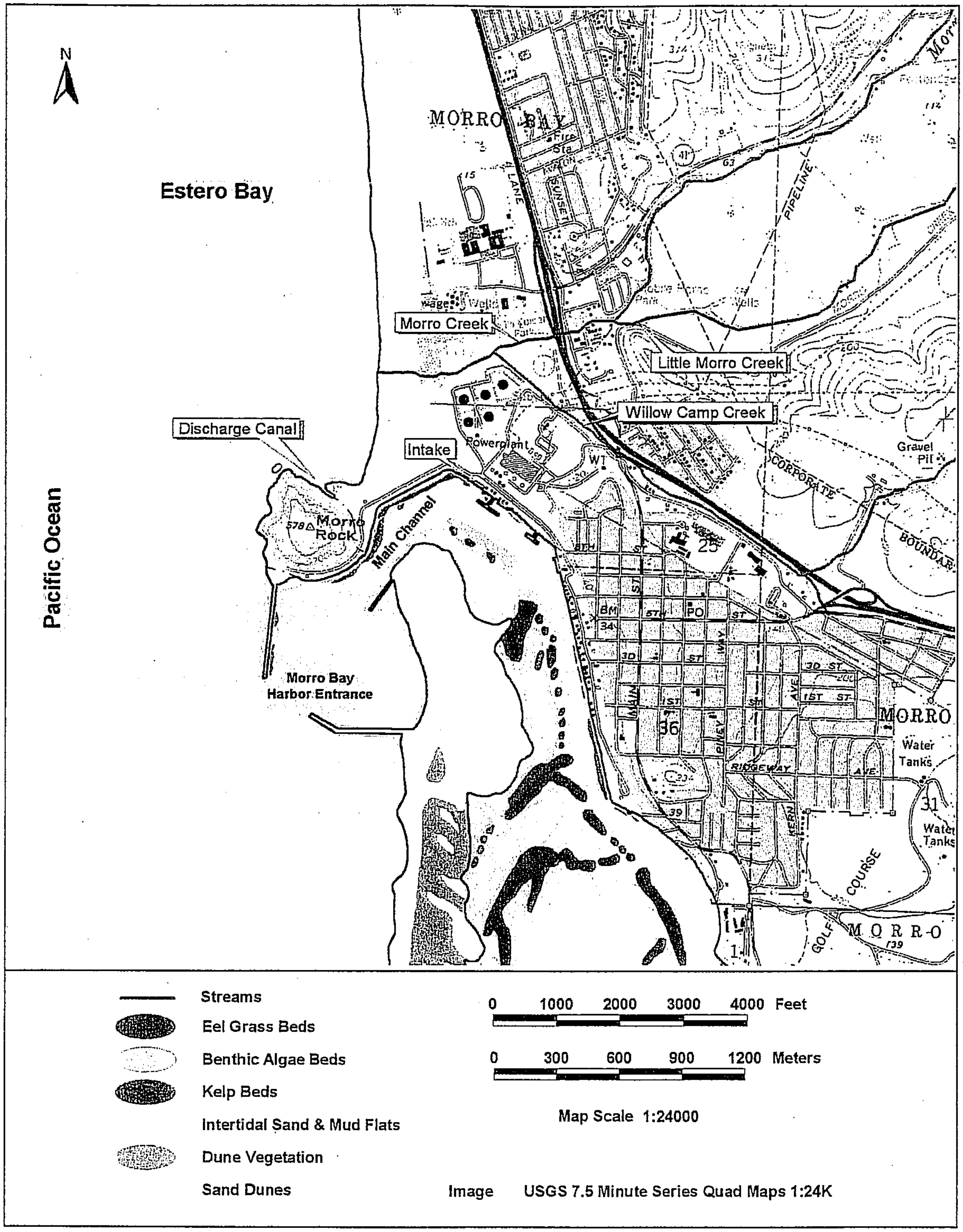


Figure 6.6A-6. Location and extent of habitat types in the vicinity of the MBPP.

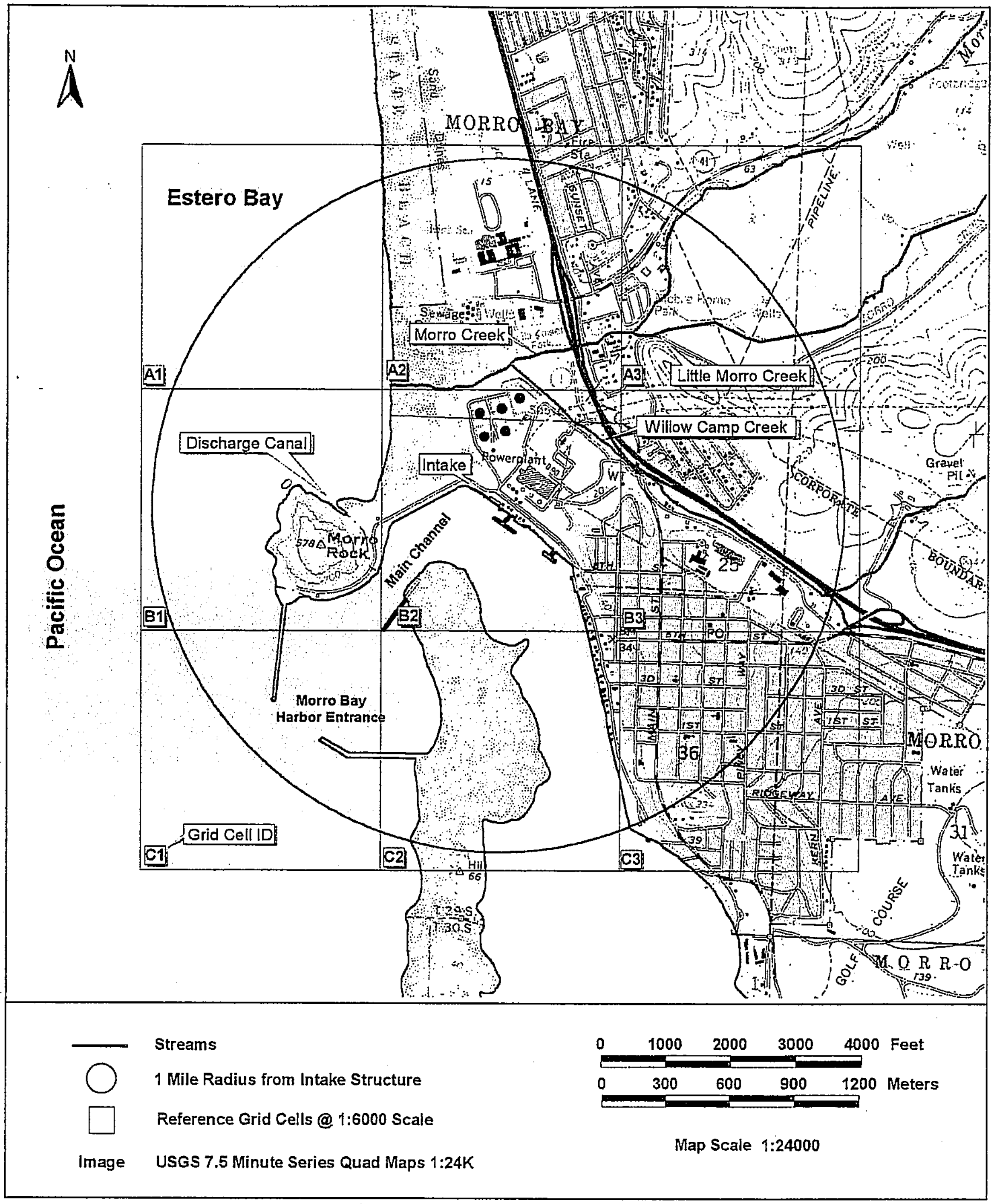


Figure 6.6A-7. Overview of individual habitat maps within a one-mile radius of the MBPP.

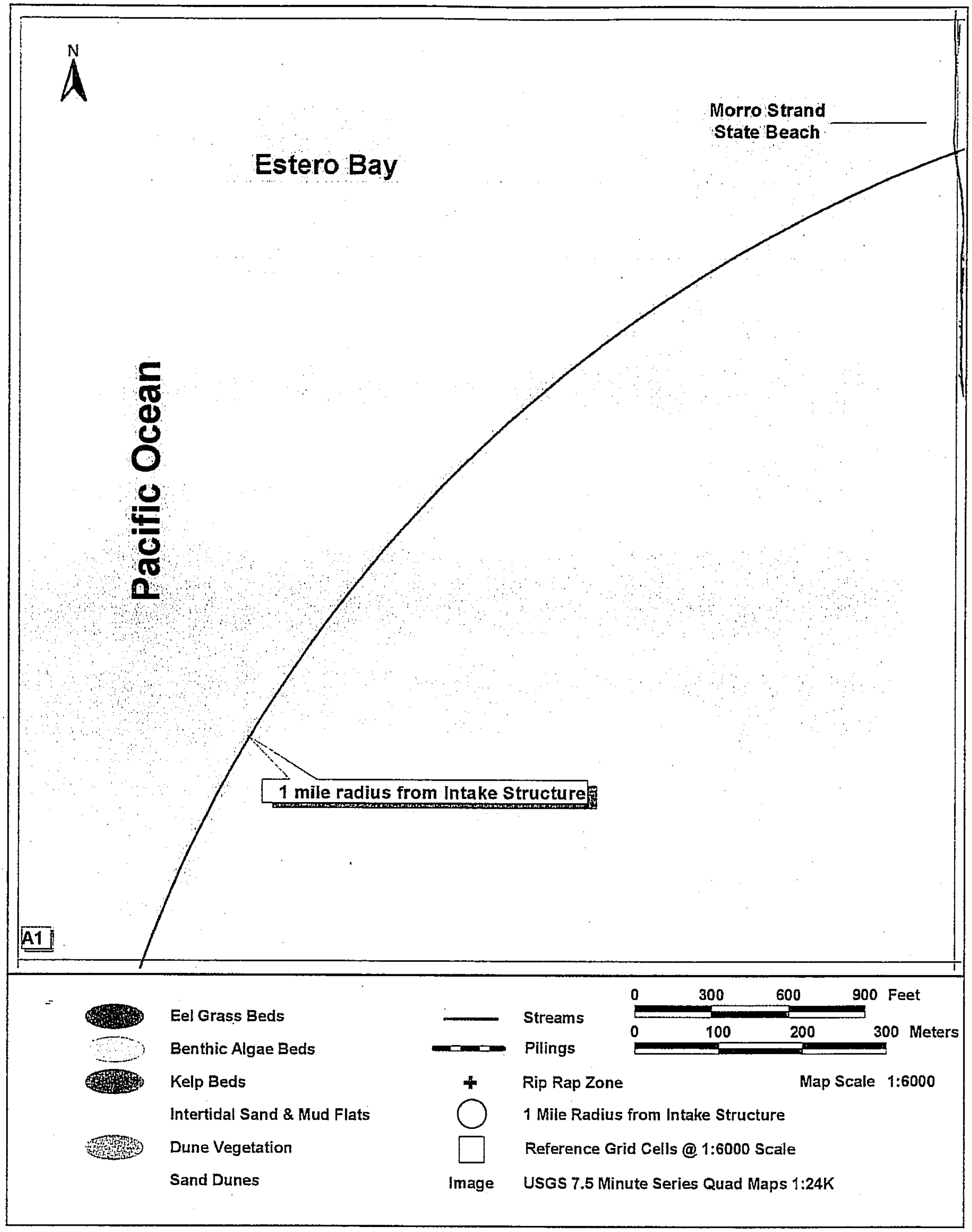


Figure 6.6A-8a. Individual habitat map of area A1 near MBPP (scale 1:6,000 scale).

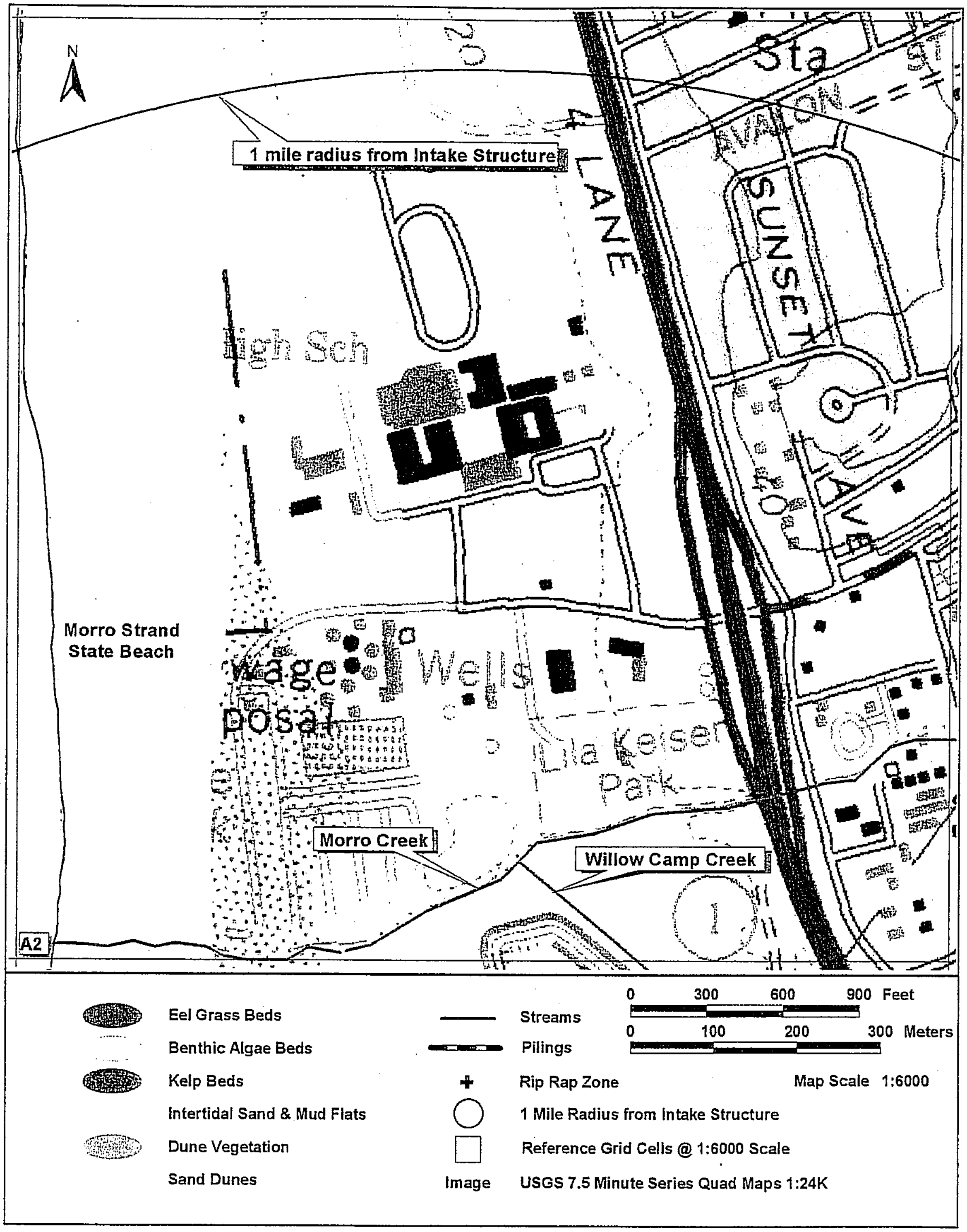


Figure 6.6A-8b. Individual habitat map of area A2 near MBPP (scale 1:6,000 scale).

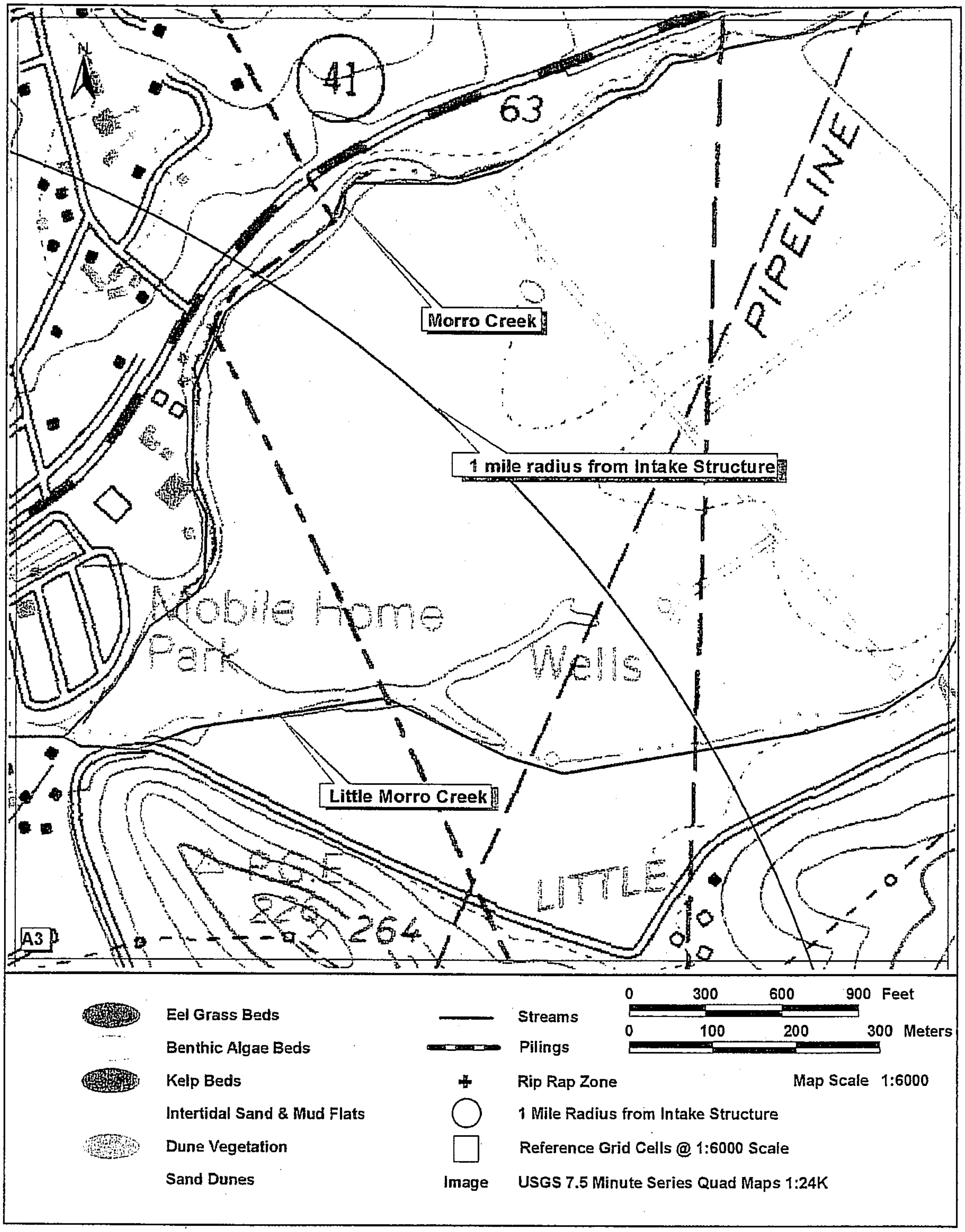


Figure 6.6A-8c. Individual habitat map of area A3 near MBPP (scale 1:6,000 scale).

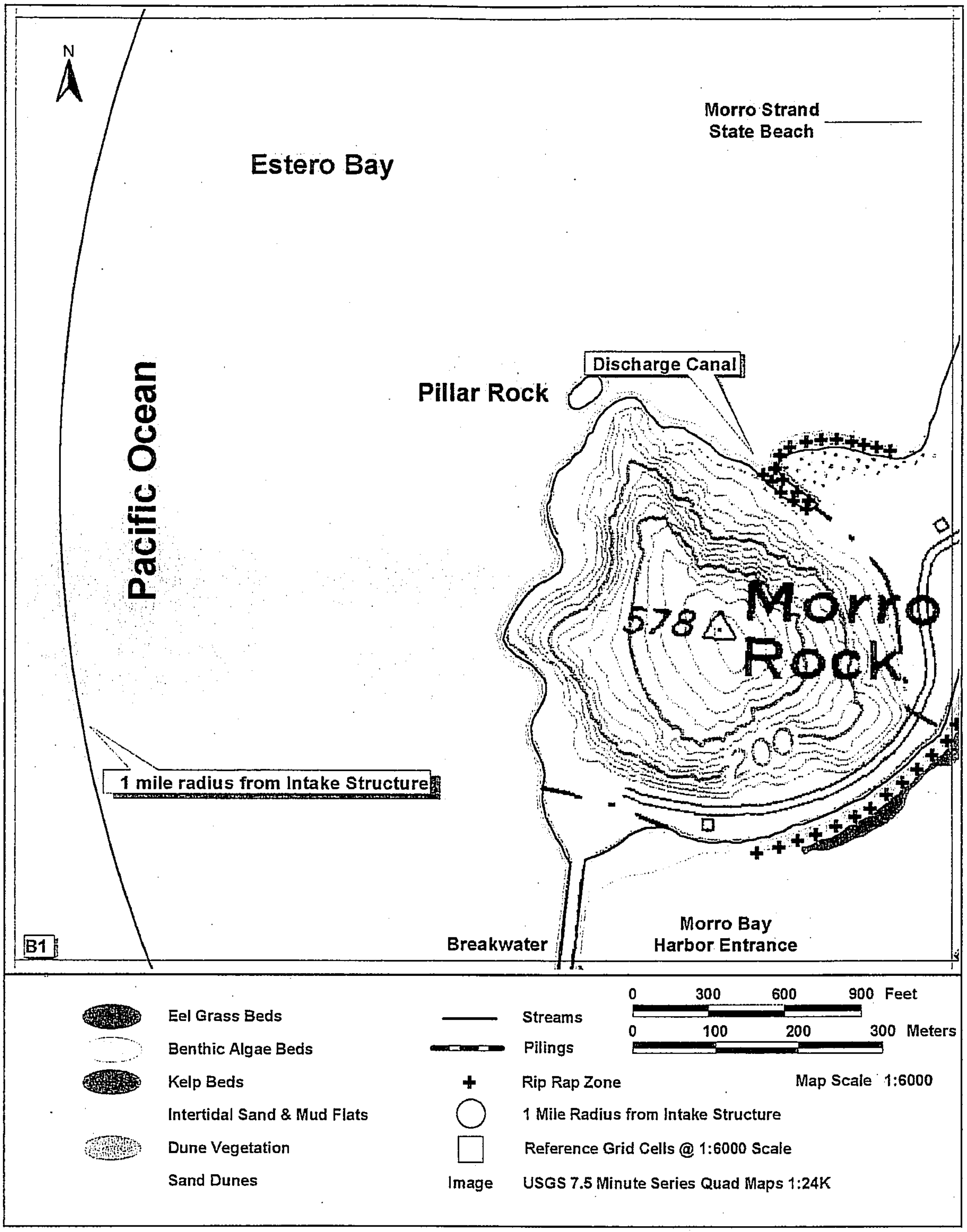


Figure 6.6A-8d. Individual habitat map of area B1 near MBPP (scale 1:6,000 scale).

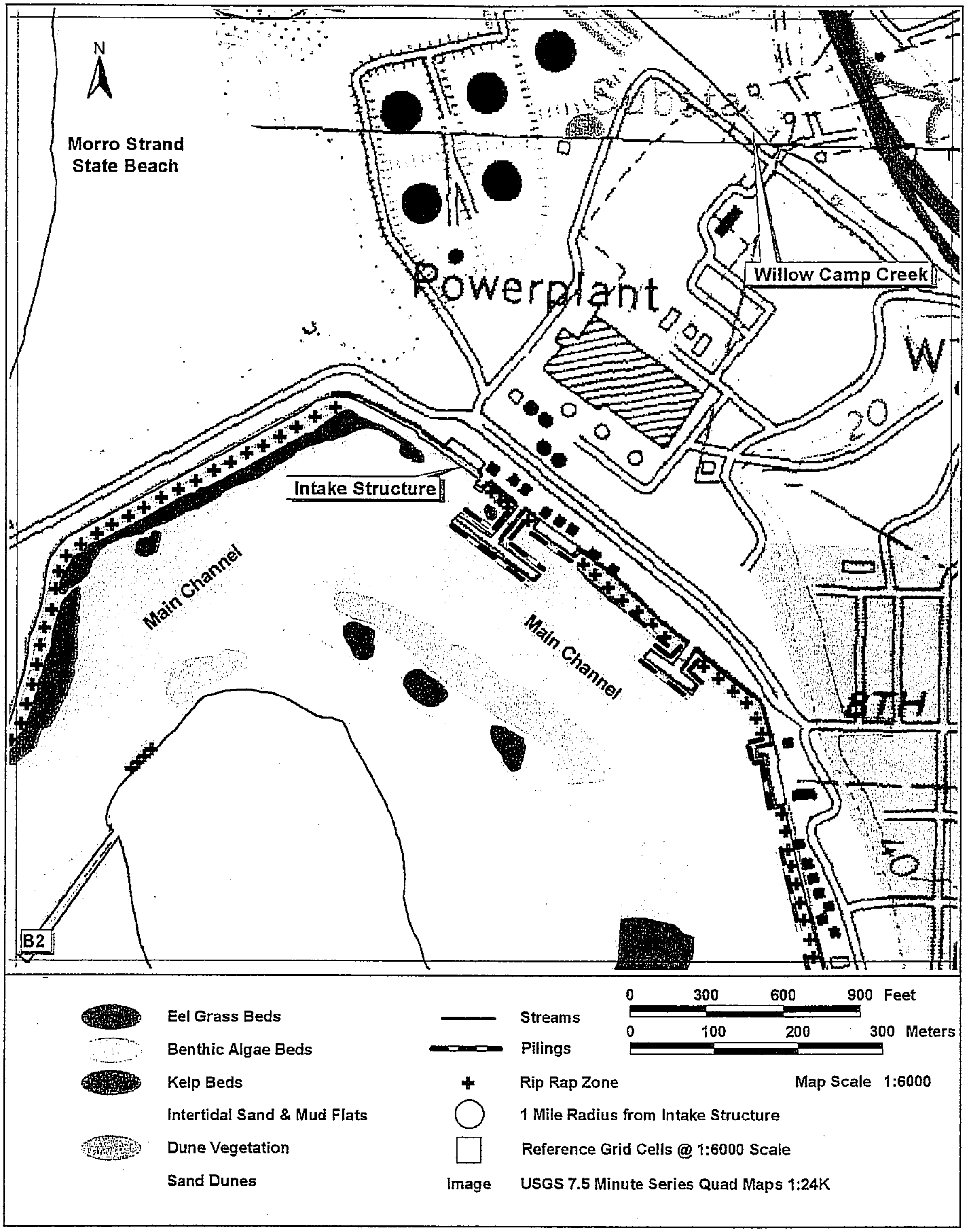


Figure 6.6A-8e. Individual habitat map of area B2 near MBPP (scale 1:6,000 scale).

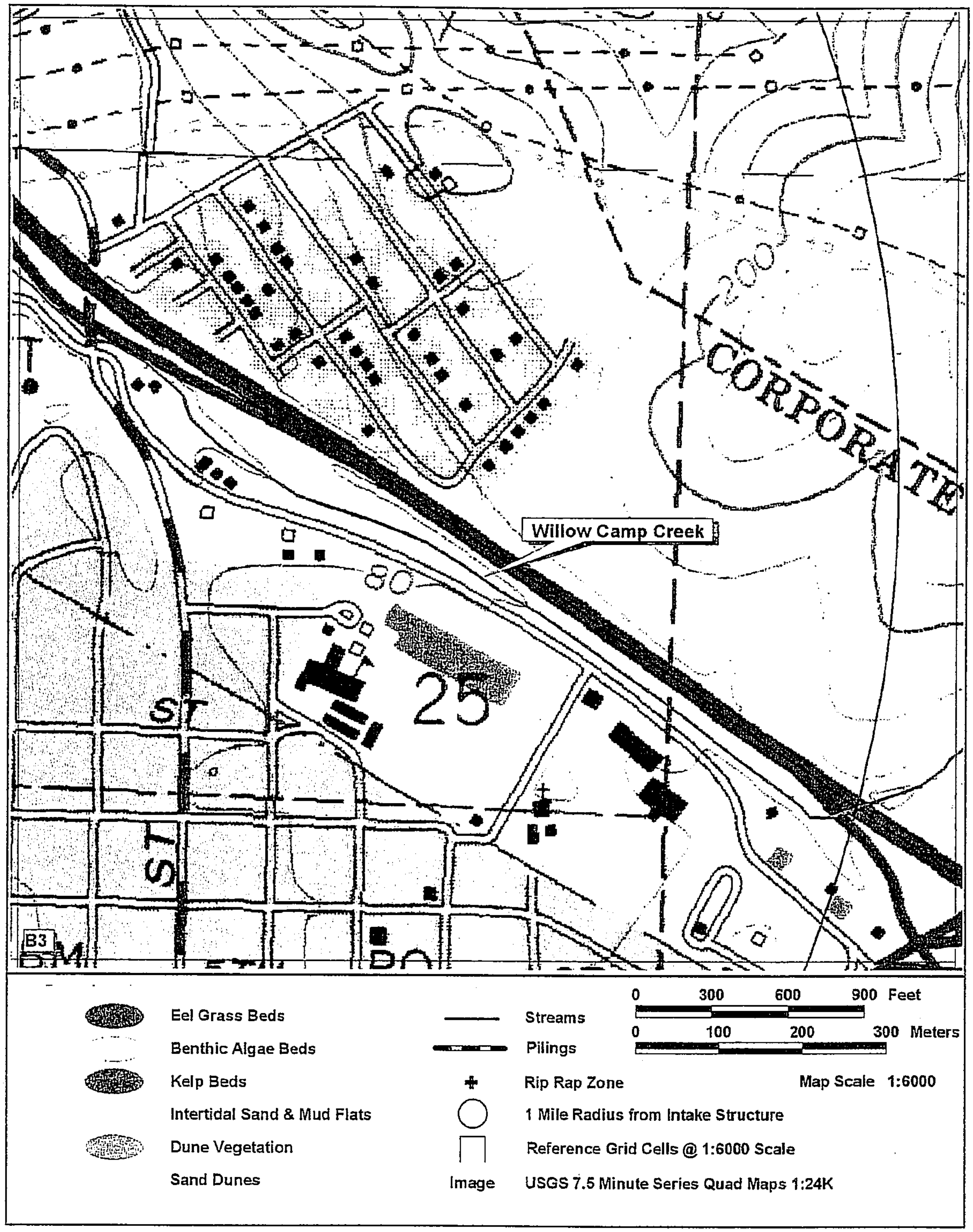


Figure 6.6A-8f. Individual habitat map of area B3 near MBPP (scale 1:6,000 scale).

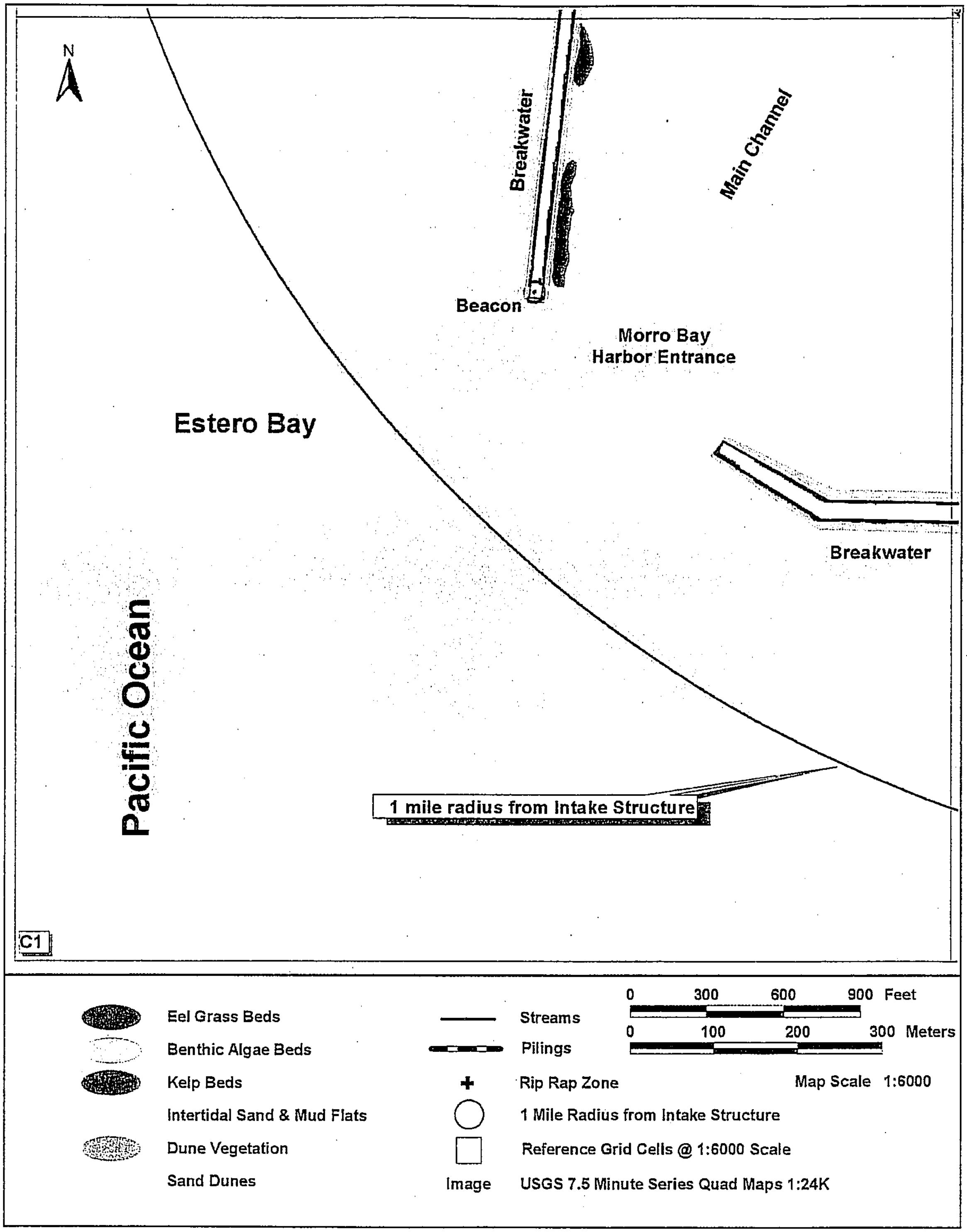


Figure 6.6A-8g. Individual habitat map of area C1 near MBPP (scale 1:6,000 scale).

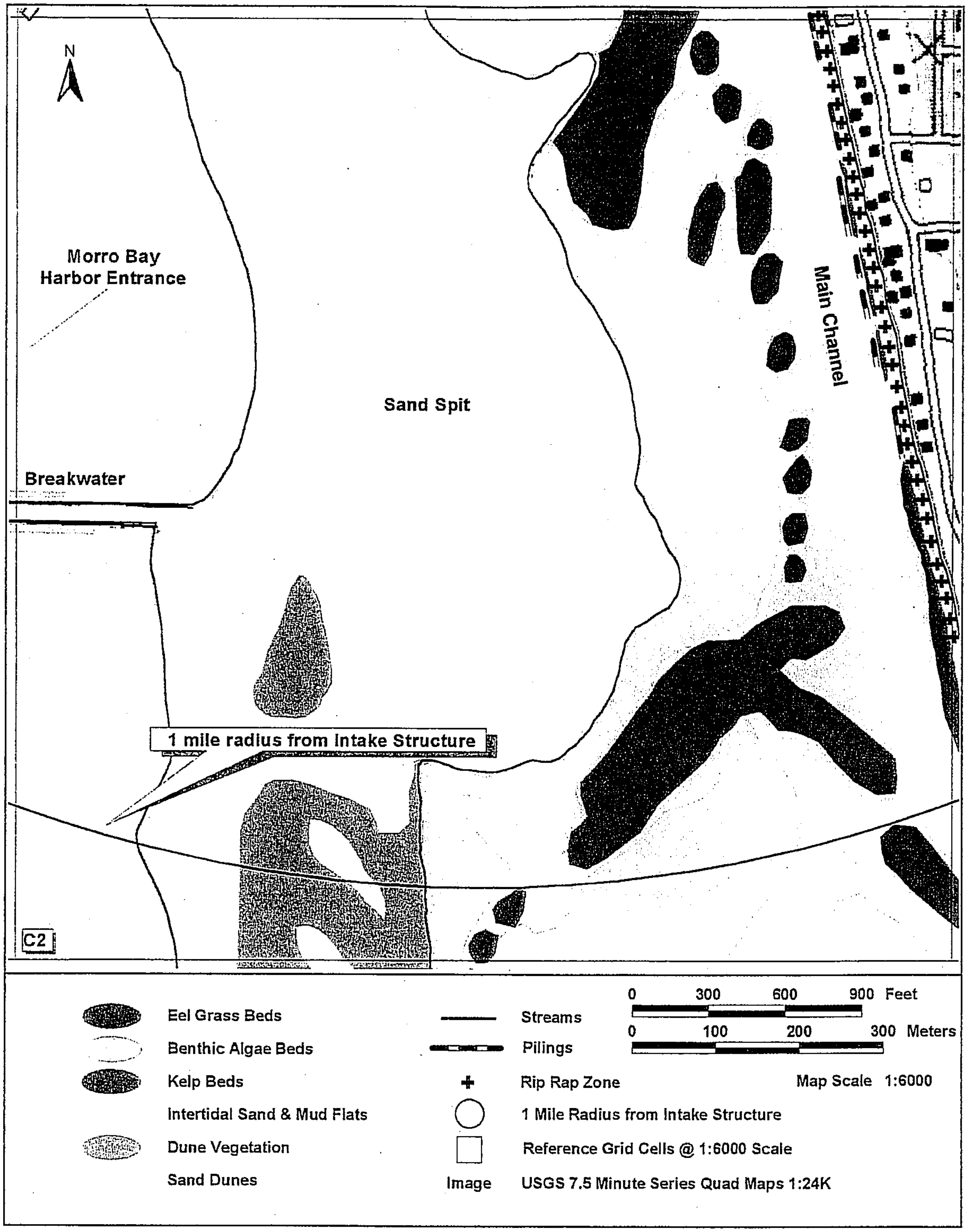


Figure 6.6A-8h. Individual habitat map of area C2 near MBPP (scale 1:6,000 scale).

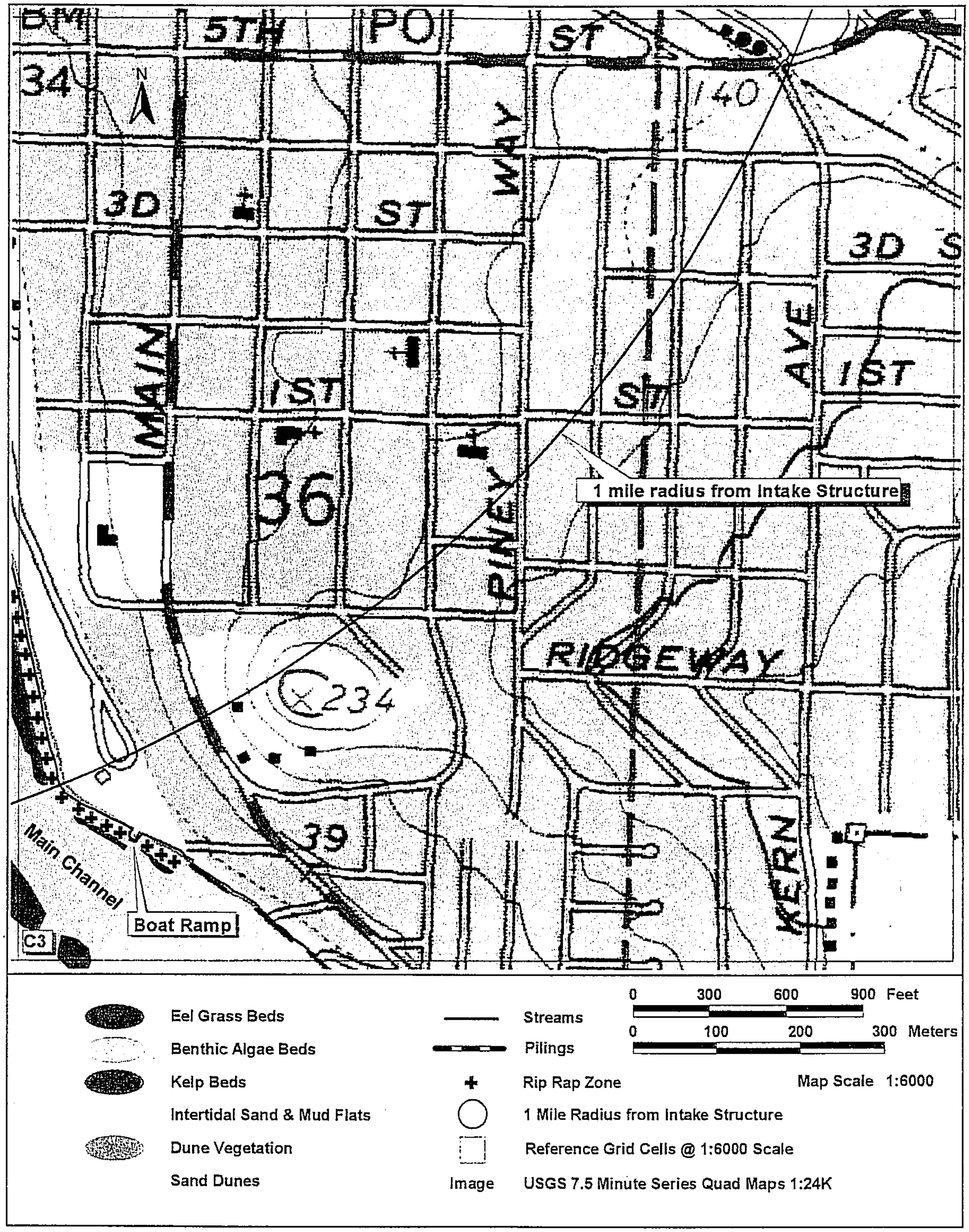


Figure 6.6A-8i. Individual habitat map of area C3 near MBPP (scale 1:6,000 scale).

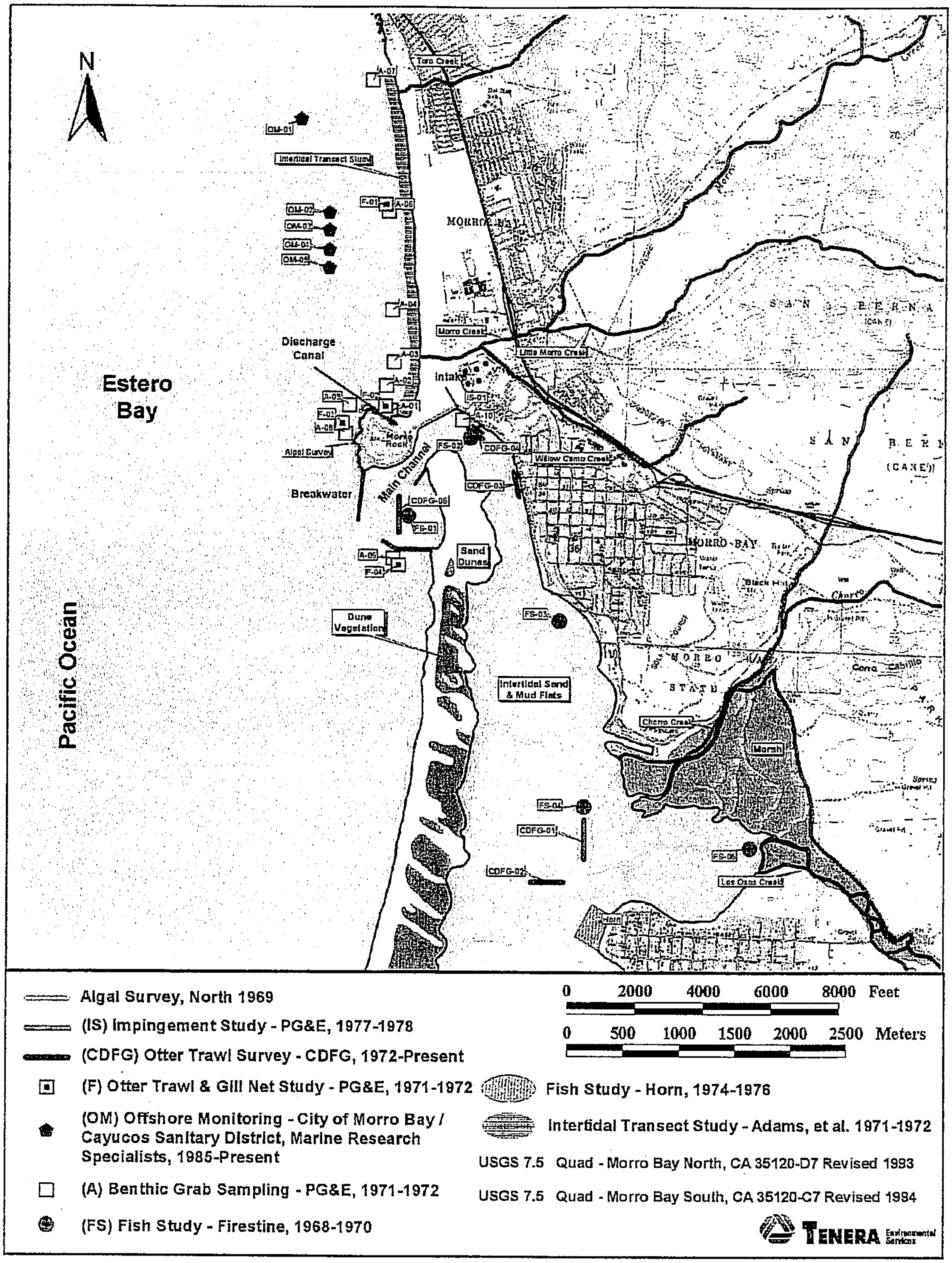


Figure 6.6A-9. Previous marine biological study locations in Morro and Estero bays.

TABLE 6.6A-2

NUMBERS OF INDIVIDUALS AND BIOMASS OF FISH SPECIES COLLECTED USING BEACH SEINE GEAR

	FEBRUARY 1976				MAY 1975				AUGUST 1975				NOVEMBER 1974				TOTALS			
	Individuals		Biomass		Individuals		Biomass		Individuals		Biomass		Individuals		Biomass		Individuals		Biomass	
Species	n	%	g	%	n	%	g	%	n	%	g	%	n	%	g	%	n	%	g	%
Topsmelt	351	16.0	3,996	8.0	998	23.4	40,940	41.2	309	14.2	9,099	41.1	1,960	65.5	7,856	29.7	3,618	31.1	61,891	31.3
Shiner perch	-	-	-	-	1,498	35.1	41,049	41.3	1,530	70.4	6,793	30.6	67	2.2	575	2.2	3,095	26.6	48,417	24.5
Pacific staghorn sculpin	1,668	76.2	2,063	4.1	644	15.1	3,649	3.7	272	12.5	3,725	16.8	196	6.5	4,444	16.8	2,780	23.9	13,881	7.0
Northern anchovy	-	-	-	-	909	21.3	1,532	1.5	2	0.09	3	-	397	13.3	280	1.1	1.308	11.2	1,815	0.9
California killifish	25	1.1	50	0.1	1	-	10	-	-	-	-	-	229	7.6	728	2.7	255	2.2	788	0.4
Bay pipefish	18	0.8	24	0.05	35	0.8	200	0.2	18	0.8	111	0.5	94	3.1	850	3.2	165	1.4	1,185	0.6
Shadow goby	26	1.2	49	0.1	64	1.5	158	0.2	27	1.2	94	0.4	2	0.1	2	-	119	1.0	303	0.2
Dwarf surfperch	7	0.3	152	0.3	77	1.8	152	0.2	-	-	-	-	6	0.2	149	0.6	90	0.8	453	0.2
Bay goby	43	2.0	6	0.01	-	-	-	-	-	-	-	-	1	-	4	-	44	0.4	10	-
Black surfperch	-	-	-	-	11	0.3	171	0.2	9	0.4	340	1.5	17	0.6	1,238	4.7	37	0.3	1,749	0.9
Jacksmelt	25	1.1	3,659	7.3	1	-	280	0.3	1	0.05	230	1.0	5	0.2	1,296	4.9	32	0.3	5,465	2.8
Gray smoothound	19	0.9	39,463	79.3	7	0.2	8,322	8.4	-	-	-	-	3	0.1	7,296	27.5	29	0.3	55,081	27.9
Pile surfperch	1	0.05	240	0.5	19	0.4	2,390	2.4	-	-	-	-	2	0.1	450	1.7	22	0.2	3,080	1.6
Pacific herring	1	0.05	88	0.2	-	-	-	-	-	-	-	-	13	0.4	1,276	4.8	14	0.1	1,364	0.7
Arrow goby	2	0.1	2	-	2	-	-	-	1	0.05	2	-	1	-	-	-	6	0.1	4	-
Walleye surfperch	-	-	-	-	3	0.1	121	-	-	-	-	-	1	-	50	0.2	4	-	171	0.1
Bat ray	-	-	-	-	-	-	-	-	3	0.1	1,760	7.9	-	-	-	-	3	-	1,760	0.9
Speckled sanddab	3	0.1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	1	-
Diamond turbot	-	-	-	-	1	-	320	0.3	-	-	-	-	-	-	-	-	1	-	320	0.2
Starry flounder	-	-	-	-	-	-	-	-	1	0.05	8	-	-	-	-	-	1	-	8	-
Rockfishes.	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	1	-	1	-
Totals	2,189		49,793		4,271		99,295		2,173		22,165		2,994		26,494		11,627		197,747	
Total species	13				16				11				16				21			

(Source: Horn, 1980)

Results of the study indicate that both diel and seasonal variations in species composition, abundance (numbers and biomass), and diversity occurred in the shallow water fish community inhabiting Morro Bay. In addition, a large proportion of the total numbers of individuals within the area was accounted for by relatively few species. This pattern was consistent with study results from three southern California estuarine systems (Mugu Lagoon, Colorado Lagoon, and Upper Newport Bay).

Fishes Collected in Morro Bay Between January 1968 and December 1970 (Fierstine et al., 1973)
The purpose of the Fierstine study was to document the fish species that utilize Morro Bay and to determine the spatial distributions and seasonal differences of the fish community within the estuary. Specific information about these aspects of the fish community was considered important for assessment of the ecological impacts of proposed developments.

Morro Bay was divided into five sampling zones (Figure 6.6A-10). Zone I encompassed the semi exposed area between the entrance breakwaters and north to Morro Rock. Zone II extended from Morro Rock, through the commercial port area, to the launch ramp. Zone III extended from the boat launch ramp to the Morro Bay State Park Museum. Zone IV was the largest zone encompassing the entire back bay, with the exception of the estuarine channels of Chorro and Los Osos creeks. This area was defined as Zone V.

A majority of sampling was accomplished with a small otter trawl net towed from a boat. Other sampling gear used included: hook and line, SCUBA and spearfishing equipment, beach and common sense seines, and dip nets. Sampling efforts were not conducted on a regular calendar schedule and few efforts were made between August and October. Otter trawls were typically conducted at low tide when fishes were concentrated in the channels.

The sampling effort conducted by Fierstine between January 1968 and December 1970 yielded approximately 1,600 fishes, representing 66 species. The Family Embiotocidae, (black perch *Embiotoca jacksoni* and shiner perch *Cymatogaster aggregata*) accounted for 22 percent of the total. Twelve species were considered to be resident in the bay due to their presence in samples during 6 or more months of the year. Twenty-six species were collected only during a single month and were considered seasonal or occasional visitors to the bay. Sampling results for the ten most abundant species collected are summarized in Table 6.6A-3.

TABLE 6.6A-3

THE TEN MOST ABUNDANT SPECIES COLLECTED DURING THE FIERSTINE STUDY BY STATION: JANUARY 1968 AND DECEMBER 1970

SPECIES	AREA I	AREA II	AREA III	AREA IV	AREA V	TOTAL
Northern anchovy		345				345
Shiner perch		1	154	130	11	296
Black surfperch		48	45	73		166
Pacific staghorn sculpin		4	15	1	100	120
Speckled sanddab			6	77		83
Topsmelt		26	33	8	6	73
Tidewater goby					58	58
English sole			35	14		49
Lingcod	1	38	2	1		42
Walleye surfperch	8	6	13	7		34

Several species that are now the subject of concern were also collected during study. Collection efforts in Zone V yielded 58 tidewater gobies *Eucyclogobius newberryi* and one steelhead rainbow trout *Salmo gairdneri gairdneri* (renamed *Oncorhynchus mykiss*). Bocaccio rockfish *Sebastes paucispinis* were also collected during the study from Zones II and III.

The limitations of the sampling methods were discussed. Fierstine speculated on techniques that could have been employed to collect samples of unsampled or undersampled species known to frequent the bay.

6.6A.1.2.2 Subtidal Channels

The salt marshes and mud flats of the Morro Bay Estuary are drained and flooded twice a day by tidal flow through a network of channels, which provide corridors between marine habitats and intertidal feeding and nursery grounds. The main artery of this network is a navigable channel that extends from the harbor entrance inland to within 1,500 feet (457 m) of Baywood Point before splitting into two secondary channels. Both secondary channels extend in a southerly direction for more than 3,200 feet (975 m) before rising to an average depth of less than 10 feet (3 m). The main channel averages 15 feet (5 m) in depth (United States Department of Commerce, 1983).

A majority of the subtidal substrate within the estuary is a composition of sand and fine sediment. A soft mixture of mud, fine sediment, and organic material is present in sections of the main channel adjacent to and between the confluence of Los Osos and Chorro creeks and in the main channel, where secondary channels deposit sediment eroded from the mud flats. Drifting mats of eelgrass *Zostera marina* and algae carpet large areas of the channel bottom in the fall and winter (R. Hardy, pers. comm., 1999). Of the several flatfish species occurring within the main channel, the most common being the speckled sanddab *Citharichthys stigmaeus* (CDFG, 1998). Surfperches are represented in the back bay by the shiner perch *Cymatogaster aggregata* and pile surfperch *Damalichthys vacca*. Bat rays are also present.

Common crab species are the brown rock crab *Cancer antennarius*, red rock crab *Cancer productus*, yellow rock crab *Cancer anthonyi*, and slender crab *Cancer gracilis* (CDFG, 1998). The swimming crab *Portunus xantussi* is frequently found near eelgrass beds. Mats of eelgrass, *Ulva* spp., *Enteromorpha* spp., and *Gracilaria* spp. drift along the bottom of the main channel and are abundant in central potions of the bay, where they form a microhabitat for juvenile fishes and crustaceans. Associated species include English sole, juvenile plainfin midshipmen *Porichthys notatus* and postlarval gobies (arrow goby *Clevelandia ios* and bay goby *Lepidogobius lepidus*) (CDFG, 1998).

6.6A.1.2.3 Intertidal Mudflats

The intertidal mud flats, a distinct region of the Morro Bay estuary, provide habitat for a diverse community of burrowing and surface dwelling invertebrates. Approximately 1,452 acres of mud flats are exposed during low tide (Gerdes, 1970), with about 150 acres covered by vegetation, primarily sea lettuce *Ulva* spp. and green alga *Enteromorpha* spp.

Numerous species of polychaetes, gastropods and crustaceans are distributed throughout the mud flats (COE, 1973), as are bivalves, including the geoduck *Panope generosa*, Washington clam *Saxidomus nuttalli*, gaper/horseneck clam *Tresus nuttalli*, and bentnose clam *Macoma nasuta* (Spear, 1973). Other inhabitants are grapsid and xanthid crabs, innkeeper worm *Urechis caupo*, blue mud shrimp *Upogebia pugettensis*, and ghost shrimp *Callianassa californiensis* (Gerdes et al., 1974). Bat rays *Myliobatis californica* and leopard sharks *Triakis semifasciata* are the largest of the mud flat predators.

Williams Shellfish Company is allotted approximately 270 acres of California's tide and submerged lands in the back bay area of Morro Bay for aquaculture use. The company cultivates and harvests Pacific oyster *Ostrea lurida*, Manila clam *Tapes philipinarum*, Quahog clam *Mercenaria mercenaria*, and bay mussels *Mytilus edulis* (R. Hardy, pers. comm., 1999).

6.6A.1.2.4 Submerged Aquatic Vegetation

Eelgrass *Zostera marina* grows in quiet, protected bays in the lower intertidal zones and subtidally (Kozloff, 1983). Most of the approximately 120 acres (J. Chestnut, consultant, pers. comm., 1999) of eelgrass beds in Morro Bay are on the lower parts of the tidal flats and in the shallow channels in the southern bay. Eelgrass beds provide forage, spawning substrate, nursery habitat, protection and cover for invertebrates and fishes.

Larger invertebrates associated with eelgrass beds include bay shrimp *Crangon* spp., spiny cockle *Trachycardium quadragenarium*, nudibranchs (e.g., *Hermissenda crassicornis*), and anemones (e.g., *Pachycerianthus fimbriatus*) (Ware, 1996; Behrens, 1999). Four species of *Cancer* crabs, yellow shore crab *Hemigrapsus oregonensis*, moon snail *Polinices lewsii* (genus name changed to *Euspira*) and sea hare *Aplysia californica* also are common (Ware, 1996). Fish species include topsmelt *Atherinops affinis*, shiner perch *Cymatogaster agregata*, speckled sanddab *Citharichthys stigmaeus* and Pacific staghorn sculpin *Leptocottus armatus* (CDFG, 1998).

6.6A.1.2.5 Coastal Salt Marsh

Salt marshes rise above the mud flats in areas where tidal flooding favors salt-tolerant terrestrial vegetation. Salt marshes moderate the effects of erosion and siltation and may act as pollution buffers. They also absorb runoff and can trap and degrade organic waste (McConnaughey and McConnaughey, 1990). Chorro and Los Osos creeks drain westward into the central part of Morro Bay, forming a delta where 444 of the 472 acres of salt marsh are located. The remainder is scattered along the southern edges of the bay. Of the 17 plant species identified, four are dominant, pickleweed *Salicornia* spp., jaumea *Jaumea carnosa*, alkali heath *Frankenia salina*, and salt grass *Distichlis spicata* (Jarque, 1998).

Polychaete worms, crabs, snails, and amphipods are dominant in this area, which provides a food-rich, protected habitat for fishes. Topsmelt is the most abundant fish found in the marsh at high tide, followed by Pacific staghorn sculpin and arrow goby. The longjaw mudsucker *Gillichthys mirabilis* occupies crab burrows beneath the marsh vegetation remaining wetted burrows during low tide.

6.6A.1.2.6 Brackish Marsh

Brackish-water marshlands border many salt marshes. Freshwater flow in Morro Bay occurs at small springs along the shores of Baywood Park, Cuesta-by-the-Sea, and the sand spit. Brackish marsh habitat occurs adjacent to Los Osos Creek and along the upper portion of the Chorro Creek floodplain. The marsh near the Chorro Creek inlet is composed of a stand of cattails *Typha* spp., tules *Scripus* spp. (WESTEC Services, 1988), sedges *Carex* spp., and rushes *Juncus* spp. (Jarque, 1998).

Many polychaete worms and amphipod crustaceans are found in the brackish marshes. Fish species in Chorro Creek and the marsh include three-spine stickleback *Gasterosteus aculeatus*, Sacramento squawfish *Ptychocheilus grandis*, speckled dace *Rhinichthys osculus*, and California killifish *Fundulus parvispinnis* (Morro Bay NEP, 1998).

6.6A.1.2.7 Rocky Intertidal/Shallow Subtidal (Pilings, Breakwaters and Wharves)

Rocky intertidal habitat is limited within Morro Bay but supports one of the bay's most diverse plant and animal communities with virtually every phylum of marine organism represented in and around the bay's rocky intertidal zone (PG&E, 1974). Hard substrate within the bay includes the two breakwaters and the along the bay's northern shore from the west breakwater to Coleman Beach. also extends south from the MBPP intake, under the City's waterfront wharves, to just south of the boat launch. Fairbanks Point and White Point contain the bay's only natural rocky intertidal habitat. Pier/wharf pilings and floating docks along the waterfront also support communities typically found in rocky intertidal areas.

The most prolific rocky intertidal communities occur on the hard substrate provided by the breakwater and adjacent to Morro Rock. The pilings of the North T-Pier also support a diverse fouling community. Encrusting vertebrate fauna is dominated by barnacles *Balanus* spp. Crab species are abundant, including commercial species such as brown rock crab *Cancer antennarius* and red rock crab *Cancer productus*. Smaller species include masking crab *Loxorhynchus crispatus*, decorator crab *Oregonia gracilis* and kelp crab *Pugettia producta*. Sheep crab *Loxorhynchus grandis* is the largest of the bay's crab species.

Fish species include pile surfperch *Damalichthys vacca*, black surfperch *Embiotoca jacksoni* and rubberlip surfperch *Rhacochilus toxotes*. Cottid species are numerous. Rockfishes, an important commercial and recreational group outside the bay, are abundant as juveniles near Target Rock, and under the North T-Pier. Populations of juvenile rockfishes vary considerably from year to year.

In 1996, the top five species by landing weight for hook-and-line boats were cabezon *Scorpaenichthys marmoratus*, gopher rockfish *Sebastes carnatus*, grass rockfish *Sebastes rastrelliger*, lingcod *Ophiodon elongatus*, and black-and-yellow rockfish *Sebastes chryosmelas* (CDFG, 1996).

6.6A.1.3 Estero Bay Resources

The discharge of the MBPP comes in contact with Estero Bay's shoreline habitat in the immediate vicinity of the discharge.

Estero Bay is a shallow bay extending from Point Estero in the north to Point Buchon in the south. The bay is situated on the northeast edge of the Santa Lucia Bank, a prominent extension of the continental shelf and an important fishing ground. A majority of the substrate in Estero Bay consists of sand and silt. Rocky substrate is concentrated near Estero and Buchon Points and adjacent to Morro Rock and its breakwaters.

6.6A.1.3.1 Sandy Beach Intertidal

Sandy beaches provide the majority of the intertidal habitat of Estero Bay. Relatively few species are able to live in this unstable habitat. The most successful species include arthropods, polychaetes (*Thoracophelia mucronata*), and molluscs (PG&E, 1974; Adams et al., 1974).

Common crustaceans include sand crab *Emerita analoga* and the spiny mole crab *Blepharipoda occidentalis* (Kozloff, 1983). Pismo clams *Tivela stultorum* and razor clams *Siliqua patula* occur on broad sandy beaches exposed to strong surf. The local population of Pismo clams has declined with expansion of the sea otters' range.

6.6A.1.3.2 Rocky Intertidal

The discharge of the MBPP contacts the rocky intertidal area along the north side of Morro Rock and the ped area separating the discharge structure from Morro Strand Beach.

Rocky intertidal habitat occurs primarily between Point Estero and Cayucos in the north, and from Hazard Canyon to Point Buchon in the south. Morro Rock and the harbor entrance breakwaters account for the only rocky intertidal habitat near the MBPP. Few studies have been published on the rocky intertidal areas of Estero Bay. However, several have been conducted in the vicinity of Diablo Cove, a few miles southeast of the Morro Bay harbor entrance. Because of proximity, and similarity in geography and habitat type, these surveys are representative of rocky intertidal flora and fauna present in the southern regions of Estero Bay.

In the vicinity of Diablo Cove, the most abundant marine alga is foliose red (*Iridaea flaccida*, genus name changed to *Mazaella*) (Burge and Schultz, 1973). Of the 50 species of organisms identified in the vicinity of Diablo Cove (Adams et al., 1974 as cited in PG&E, 1974), more than one-half were molluscs, primarily gastropods. Common fish species include clingfishes, gunnels, sculpins and pricklebacks, adapted to extreme variations in temperature, salinity, and oxygen. Grass rockfish, cabezon, and black-and-yellow rockfish also are able to withstand the rigors of tidal fluctuations and can be found wedged in rock crevices.

6.6A.1.3.3 Sand-Mud Subtidal

The buoyant MBPP discharge plume only comes in contact with subtidal habitats at depths less than 2 to 3 m (7 to 10 ft) in a small area immediately in front of the discharge and to the north in the surf zone of Morro Strand State Beach.

Bottom-dwelling (benthic) species appear in clumped distributions within the bay's vast expanses of sand and soft bottom. Nemertean worms, amphipods, and snails were abundant in surveys conducted in 1971-72 (PG&E, 1973). Sand dollars *Dendraster excentricus* are common. The

Pacific sanddab *Citharichthys sordidus* is the most abundant demersal fish species collected in deep water off Diablo Canyon (Burge and Schultz, 1973) and is frequently caught by recreational anglers in Estero Bay.

California halibut *Paralichthys californicus* is one of the top predators in this environment and is sought by both commercial and recreational fishermen, although most halibut landed in San Luis Obispo County in 1996 were caught outside Estero Bay (CDFG, 1996). Other common demersal species include starry flounder *Platyichthys stellatus*, sand sole *Psettichthys melanostictus* and turbot *Pleuronichthys* spp. Numerous elasmobranch species are well adapted for this habitat, including Pacific angel sharks *Squatina californica*, thornbacks *Platyrhinoidis triseriata*, and round stingrays *Urolophus halleri*. Aggregations of round stingrays are commonly found in the thermal effluent of MBPP. Shovelnose guitarfish *Rhinobatos productus* are often found in shallow regions, while spiny dogfish sharks *Squalus acanthias* are more common in deeper regions.

6.6A.1.3.4 Rocky Subtidal

The MBPP CWIS discharge plume contacts approximately 200 m (660 ft) of rocky subtidal habitat along the northern base of Morro Rock.

Subtidal rocky substrate within Estero Bay is concentrated in four regions: between Point Estero and the Cayucos Pier, from Hazard Canyon to Point Buchon, riprap adjacent to Morro Rock and its breakwaters, and rocky promontories and ridges along the beach from Cayucos to Hotel Point.

Based on surveys of Diablo Cove, important brown algae of the shallow subtidal canopy include *Cystoseria osmundacea, Egregia menziesii,* and *Nereocystis luetkeana*. *Botryoglossum* was the dominant red foliose algae (Burge and Schultz, 1973).

Subtidal surveys of Diablo Cove in 1970 and 1971 by CDFG identified 24 fish species. Juvenile rockfishes were dominant. Scorpaenids dominated the adult fish counts, and blue rockfish *Sebastes mystinus* were common. Other abundant species were painted greenling *Oxylebius pictus* and blackeye goby *Coryphopterus nicholsii* (Burge and Schultz, 1973). Invertebrate fauna included gastropod molluscs, echinoderms, and a variety of arthropods. The red abalone *Haliotis rufescens* was reported to be the most important commercial invertebrate species. The abalone fishery in the area has since been discontinued by a ban on commercial abalone harvest.

Fishes have replaced abalone as the most important commercial resource in Estero Bay, with rockfishes *Sebastes* spp. the focus of the area's live-fish fishery. Cabezon, lingcod, and kelp greenling *Hexagrammos decagrammus* also are harvested. Cabezon and several nearshore rockfish species have attained increased commercial importance in the last decade due to expansion of markets for live fish. Seventy-seven percent (189,000 pounds) of the state's recorded cabezon landings during 1996 were landed in Morro Bay and Port San Luis. The top five species in San Luis Obispo County by weight were cabezon, gopher rockfish, grass rockfish, lingcod, and black-and-yellow rockfish (CDFG, 1996). Rocky subtidal areas from Cambria to Point San Luis (including Estero Bay) have been subjected to intense fishing pressure since this fishery began.

6.6A.1.3.5 Kelp Beds

No kelp beds are contacted by the MBPP discharge plume.

Kelp beds are one of the most prominent features along the Pacific Coast. In kelp beds all major phyla are represented, but the most conspicuous are gastropods, polychaetes, sea stars, bivalves, sponges, tunicates, and crabs. In Estero Bay, kelp beds are distributed within the subtidal rocky areas from Point Estero to Cayucos Creek in the north and Hazard Canyon to Point Buchon in the south. Kelp is also present within Morro Bay near its entrance. Two dominant species of canopy-forming kelp are found in Estero Bay, giant kelp *Macrocystis pyrifera* and bull kelp *Nereocystis leutkeana.* In the early 1970s, kelp beds in the bay consisted almost entirely of bull kelp (Burge and Schultz, 1973). Giant kelp is now the dominant species in the northern regions of the bay. Stands of individual giant kelp plants are also present along the subtidal riprap adjacent to Morro Rock. Kelp is economically important; CDFG regulates its harvest. Kelp harvested from Estero Bay is primarily used as food for farmed abalone.

6.6A.1.3.6 Open Water Nekton and Plankton

The MBPP CWIS discharge creates a buoyant surface plume that rapidly dissipates with little or no contact with open water fishes or plankton. Studies of the MBPPs discharge on this habitat are summarized in the Section's Project Impact Assessment.

Phytoplankton form the base of the marine food chain and reside in the top 50 to 165 feet (12 to 50 m) in coastal areas (Smith, 1993), represented by diatoms and dinoflagellates. Diatoms bloom in the spring. During summer, dinoflagellates become more common as diatoms decline. When light, nutrient level, salinity and temperature are in certain proportions, blooms may occur, causing "red tides." California Department of Health Services monitors phytoplankton along the coast, conducting sampling off of Cayucos in Estero Bay and inside Morro Bay.

Seasonal abundances of northern anchovy *Engraulis mordax* and Pacific sardine *Sardinops sagax* occur in Estero Bay. Populations fluctuate dramatically, with several decades of abundance followed by greater periods of scarcity. During one sampling (PG&E, 1973), a total of 553 fishes, representing 32 species, were caught. The white surfperch *Phanerodon furcatus* was the most dominant species. Walleye surfperch, jacksmelt, silver surfperch, Pacific sanddab, and topsmelt also were common. Twenty-two percent of the fishes were caught in the ambient temperature range, approximately 9 percent in the transitional temperature range, and approximately 70 percent in the discharge temperature. The results showed that most of the species occurred equally in the ambient and discharge temperature ranges.

The barred surfperch *Amphistichus argenteus* is the focus of a small but stable commercial fishery in the area. Landings of mostly barred surfperch totaled 32,000 pounds (41 percent of state total) in San Luis Obispo County in 1996 (CDFG, 1996). The most important commercial fish species in Estero Bay is king salmon *Oncorhynchus tshawytscha*, typically present from before the opening of sport salmon season in March, until mid or late July. County landings of king salmon totaled 122,000 pounds in 1996 (CDFG, 1996). Although Estero Bay accounted for only a minor percentage of this total, the recreational salmon fishery is important economically to the Morro Bay area.

6.6A.1.4 Pelagic Seabirds

Morro Bay and Estero Bay are an integral part of the Pacific Flyway, the migratory pathway that water-associated birds follow from their northern breeding grounds to the wintering grounds. Almost since counts began in Morro Bay (1957), the area has been within the top 15 areas in the nation in terms of number of species observed (COE, 1973). Over 25,000 individual birds have been counted in the bay at one time (Gerdes et al., 1974). Migration into the bay begins around mid-June and peaks in mid-February (Gerdes et al., 1974).

The most significant waterfowl in terms of total numbers in Morro Bay is the black brandt *Branta bernicla,* a sea goose that feeds on aquatic plants, especially eelgrass and sea lettuce, in shallow bays and estuaries. The Canada goose *Branta canadensis* and the tundra swan

Cygnus columbianus are occasional winter visitors, observed regularly, but considered unusual (Gerdes et al., 1974).

Some migrants, such as the common tern *Sterna hirunda*, least-storm petral *Halocyptena microsoma* and the phalaropes (*Phalaropus fulicarius, Steganopus tricolor, Lobipes lobatus*) use the area to feed and rest during migration. The Manx shearwater *Puffinus puffinus* usually inhabits the high seas but is an occasional migrant to the bay. There have been rare observations of the California least tern *Sterna antillarum browni*, an endangered species in California (Gerdes et al., 1974).

Migratory birds account for most of Morro Bay's pelagic birdlife during winter months and make heavy use of the sand spit for resting, as it is isolated from human disturbance and provides broad expanses of shoals at low tide. Aggregations of white pelicans *Pelcanus erthrorhynchos,* mew gulls *Larus canus*, herring gulls *Larus ardentatus*, royal terns *Sterna maxima*, and elegant terns *Sterna elegans*, are regularly found as winter visitors. Pelagic birds such as the northern fulmar *Fulmarus glacialis* occur in large flocks around fishing boats. The common murre *Uriga aalge* and Cassin's auklet *Ptychoramphus aleuticus* are seen in the bay from September to May when they nest in colonies on isolated coastal cliffs (McConnaughey and McConnaughey, 1990).

A few migratory species of pelagic birds are seen during the summer months. The pink-footed shearwater *Puffinus creatopus,* sooty shearwater *Puffinus griseus*, ashy petral *Oceanodroma homochroa*, and black petral *Loomelania melania* are seen in the bay from April to October (Gerdes et al., 1974).

Seaducks such as the surf scoter *Melanitta perscipillata*, white-wing scoter *Melanitta fusca*, lesser scaup *Aythya affinis*, and bufflehead *Bucephala albeolaare* are fairly common visitors during the winter months, some remaining all year. Dabbling ducks, such as mallard *Anas platyrhynchos*, ruddy duck *Oxyura jamaicensis*, green-winged teal *Anas carolinensis*, pintail *Anas acuta* and cinnamon teal *Anas cyanoptera* are resident waterfowl. They are present all year, inhabit the shallows of the estuary, and are known to breed in the area.

Five species of grebes are found as winter visitors to the bay. Four species of loons are also noted in the bay.

An important heron and cormorant rookery is located at Fairbanks Point and has been active for over 50 years (Gerdes et al., 1974). Great blue herons *Ardea herodias*, black-crowned night herons *Nycticorax nycticora*, and Brandt's cormorants *Phalacrocorax penicillatus* are commonly observed roosting in the eucalyptus grove there.

6.6A.1.5 <u>Fully Protected Species</u>

Three of the species listed by the CDFG as endangered or Species of Special Concern are reported to occur in the area. These include the southern sea otter, the steelhead, and the tidewater goby. The southern sea otter comes under the jurisdiction of the Marine Mammal Protection Act of 1972 and is therefore protected by Federal mandate, which supercedes state jurisdiction. The Commerce Department's National Marine Fisheries Service announced in 1997 the listing of several populations of Pacific steelhead rainbow trout under the Federal Endangered Species Act (ESA) of 1973. The tidewater goby is listed as endangered under the Federal ESA and is considered a Species of Special Concern Class I with the CDFG. In August 1999, the USFWS issued a proposed rule under the ESA to remove the northern population of the tidewater goby (the population north of Orange County, California) from the list of federal endangered and threatened species. This would include the population of tidewater goby in the Morro Bay area.

6.6A.1.5.1 Steelhead Rainbow Trout

No MBPP operating impacts on steelhead rainbow trout (steelhead) result from the existing MBPP intake and discharge nor are any expected as a result of the reductions in intake or discharge volumes of the modernized facility. Steelhead (*Oncorhynchus mykiss*) are powerful swimmers that migrate during the spring and summer months from the open ocean through Morro Bay into both Chorro and Los Osos creeks. Juvenile steelhead usually migrate to sea in the spring when they are from 6 to 8 inches in length. Steelhead can avoid the thermal plume in Estero Bay. They have not been collected in impingement samples from the recently completed 12-month 1999 to 2000 impingement study. Larval steelhead are not found in the vicinity of the intake and therefore would not be susceptible to entrainment.

Steelhead are the anadromous form of rainbow trout found in watersheds along the Pacific Coast from Alaska to southern California. The most recent findings show that the distribution of steelhead in California has been greatly reduced. Estimates place the total statewide population at 250,000 adults (CDFG, 1996). Known spawning populations are found in coastal streams from Malibu Creek in Los Angeles County to the Smith River near the Oregon border, and in the Sacramento River system. Much of the coastline of southern Monterey and San Luis Obispo Counties is relatively undeveloped so many of the small coastal streams still contain steelhead populations. Status of the populations in the Morro Bay/San Luis Obispo area range from healthy to severely depressed (CDFG, 1996).

Steelhead migrate during the spring and summer months from the open ocean through Morro Bay into both Chorro and Los Osos Creeks. These creeks have historically supported steelhead populations and both still have remnant populations of resident steelhead (Highland, 1999). In recent years, large numbers of ocean run fish have been documented in Chorro Creek (Morro Bay NEP, 1999). They are also found in Morro and San Simeon Creeks and most of the coastal streams in the county (WESTEC Services, 1988; J. Nelson, CDFG, pers. comm., 1999).

The southern steelhead is distinguished from other California steelhead populations by their unique life history, adaptation to a semiarid climate, and geographic location. The southern steelhead is the most jeopardized of all of California's steelhead populations. The steelhead in the Chorro Creek watershed are an important genetic resource in that they represent one of the southernmost remaining runs on the Pacific Coast. The southern stocks have adapted genetically to withstand variations in habitat that are not tolerated by northern stocks (e.g., warm water temperatures, low dissolved oxygen and extended drought conditions (CDFG, 1998).

During their juvenile life phase, a fresh water habitat and low-salinity estuarine environment are vital to the steelhead's survival. Estuaries and lagoons provide optimum nursery environments for juvenile steelhead. Steelhead typically migrate to marine waters after spending 2 years in fresh water, but some remain for less than a year and others remain for up to 3 years. Juveniles migrate to sea when they are from 6 to 8 inches in length. This migration is usually in the spring, but there are steelhead entering the ocean year round throughout their range (J. Nelson, CDFG, pers. comm., 1999). Steelhead adapt quickly to higher salinity levels and probably spend no more than a week migrating from the bay to the open ocean (D. Highland, CDFG, pers. comm., 1999). They reside for 2 or 3 years in the ocean before returning to their natal stream to spawn as 4- to 5-year olds. Steelhead, unlike salmon, are capable of spawning more than once before they die.

Steelhead require clean gravel-bottom substrate and clear flowing waters for spawning. The middle reach of Chorro Creek contains the majority of spawning habitat, but most of this reach becomes dewatered during the summer months due to agricultural diversions. Spawning steelhead require cool water temperatures with a preferred temperature range from 39 to 52 degrees Farenheit (3.9 to 11.1 degrees Celcius). Steelhead prefer to spawn in areas with water velocities of about 2 fps (Bovee, 1978). Until water velocities reach 10 to 13 feet per second, the swimming ability of adult steelhead is not hampered (CDFG, 1998). Egg mortality begins to occur at 56° F (13.3° C). Steelhead have difficulty extracting oxygen from water at temperatures greater than 70° F (21.1° C) (Hooper, 1973).

Steelhead are extinct or at low levels throughout the West Coast because of a combination of human activities and poor natural conditions. Habitat degradation, hatchery production, and over-harvest have reduced the fish's ability to cope with variable environmental conditions (Capelli, 1998).

6.6A.1.5.2 Southern Sea Otter

There is no reason to expect a healthy sea otter to be adversely affected in any way by either the existing or modernized MBPP intakes or discharge. They can freely swim in and out of the discharge plume and avoid the intakes.

The current range of the southern sea otter (*Enhydra lutris nereis*) is from Cojo Cove south of Point Conception to Año Nuevo Island in Santa Cruz County. There are now roughly 2,200 sea otters (Harris, 1999) living in a 250-mile range along the central coast. The current population count has been declining at a rate of 4 percent per year since 1995 (B. Hatfield, USFWS, pers. comm., 1999). Although sea otters began to reoccupy the Morro Bay area from Estero Point to Point Buchon between 1972 and 1974 (Wild and Ames, 1974), it was not until 1982 that significant numbers of otters were found within the harbor at Morro Bay (Bodkin and Rathburn, 1988). In more recent years, fewer otters have been observed using the bay as a resting and feeding area.

Otters eat a variety of foods including clams, sea urchins, abalone, crabs, and many different types of invertebrates. A study done by the USFWS (1988), found that clams were the principal prey items of otters foraging in Morro Bay, representing 92 percent of the prey items retrieved. Washington clams (*Saxidomus nuttalli*) and gaper clams (*Tresus nuttalli*) accounted for 59.8 percent and 32.3 percent, respectively, of the total bivalves obtained. Foraging success generally increased toward the back bay and the species composition shifted from gaper to Washington clams.

The abundance of sea otters in Morro Bay is highly seasonal (Bodkin and Rathburn, 1988), and closely follows the typical pattern of late winter kelp canopy degeneration observed along much of the central California coast (USFWS, unpubl. data). It appears that canopy-forming kelp forests (e.g., *Macrocystis pyrifera*) are somehow related to male sea otter reproductive success in California. Morro Bay may be important as a winter refuge for territorial males that abandon their territories during this period (Bodkin and Rathburn, 1988).

During the Fish and Wildlife Service study (Bodkin and Rathburn, 1988) 2,291 otter observations were recorded throughout the bay. Most of these observations occurred between the harbor mouth and what is now Tidelands Park. Observations indicate that the principal areas used by otters for foraging and resting are subject to regular fluctuations. Prior to the dredging (March 1987) of the main channel, foraging otters were most frequently observed on the eastern side of the main channel between the North T Pier and Tidelands Park. The following year, otter foraging activity appeared to shift toward the back bay. Sea otters that were resting, feeding, and grooming were most often observed in the protected waters along the sand spit west of the main channel. Prior observations (Siniff and Ralls, 1985) reported otter resting activity in the kelp beds near Target Rock. From the distribution of these otter observations, foraging appears to be the activity that may draw otters to the area near the MBPP intake. With the exception of foraging, observations indicate that otters avoid the busy areas of the bay adjacent to the waterfront and the MBPP intake.

6.6A.1.5.3 Tidewater Goby

Tidewater gobies (*Eucyclogobius newberryi*), a California native species, are small fish averaging approximately two inches in length. The tidewater goby can be found at the upper ends of lagoons and brackish bays at the mouths of coastal streams ranging from Tillas Slough in Del Norte County to Aqua Hedionada Lagoon in San Diego County. It is not distributed continuously throughout its range however, and is absent in several sections of coastline in northern California. Within the Morro Bay Estuary, tidewater gobies have been documented in brackish marsh habitats near the mouths of Chorro and Los Osos Creeks, but have not been observed there since 1984 (Morro Bay NEP, 1999).

No adult tidewater gobies have been reported in the estuary in recent surveys (R. Nakamura, Cal Poly, pers. comm., 1999) nor have any been collected in the recently completed year-long impingement study (September 9, 1999 through September 8, 2000). Larvae that were tentatively identified as tidewater goby were collected in front of the MBPP cooling water intakes and at several Morro Bay source water stations during the 1999-2000 entrainment study. The identifications were verified by taxonomic experts in early August 1999. Nearly 10 percent of the verified specimens were sent to Dr. David Jacobs (UCLA) for DNA analysis. Recently completed DNA analysis, performed on these specimens, refute the identifications. None of the specimens are tidewater goby based on the DNA test results. Eighty-five percent of the specimens were genetically identified as shadow goby *Quietula y-cauda*. The DNA from the remaining specimens were from unknown gobies whose DNA did not match any of the sequencing information in the laboratory's data banks; these "unknown gobies" did not match tidewater goby DNA.

All life stages of the tidewater goby are restricted to California coastal wetlands with low salinities (<10 ppt). Most of the year tidewater gobies form loose aggregations from a few fish to several hundred fish. They congregate on sandy substrate in lagoons and lower parts of creeks in water less than three feet deep. Nesting activities begin in late April and continue through early May. Gobies require clean, coarse sand, and water temperatures ranging from 75.6 to 79.6° F (24 to 26° C), for building nesting burrows. The gobies are most abundant during the fall and late summer, and before winter flood events when lagoons and creeks can be scoured by intermittent flooding. Most gobies do not survive the winter storm season and those that do are usually sub-adults. The few fish that do survive repopulate suitable habitats in the spring (Rathburn et al., 1993). The lack of a marine phase restricts movements between populations and greatly lowers the ability of this species to recolonize an area once it has been extirpated.

6.6A.2 IMPACTS TO MARINE RESOURCES

Significance criteria were determined based on California Environmental Quality Act (CEQA) Guidelines, Appendix G, Environmental Checklist Form (approved January 1, 1999) and performance standards or thresholds adopted by responsible agencies. An impact may be considered significant if the Project results in:

- A substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.
- Substantial interference with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impedes the use of native wildlife nursery sites.
- A conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.
- A discharge that fails to provide adequate protection to beneficial uses including the protection and propagation of a balanced indigenous community of fish, shellfish, and wildlife, in and on the body of water into which the discharge is made.

The project is also required under Section 316(b) of the 1972 Federal Clean Water Act to employ the best technology available to reduce significant adverse impacts of the facility's cooling water intake system.

6.6A.2.1 Cooling Water System Effects on Marine Biology

MBPP is an ocean-sited steam electric generating facility that employs seawater in its once-through cooling water system. The site of the MBPP is a preferred location due the abundant nearshore supplies of cold ocean water for cooling water purposes. As discussed in Section 6.5.1.1, California's energy policy recognizes this attribute of coastal power plant sites and recommends such sites over inland sites and the consumptive use of California's limited freshwater supplies.

The Project includes replacement of Units 1 through 4 with two combined-cycle units. The existing intake structure will remain the same except for the replacement of the circulating water pumps. One combined-cycle unit will utilize the existing seawater intake structure for Units 1 and 2 and the discharge line for Unit 3, and the other combined-cycle unit will utilize the existing seawater intake structure for Units 3 and 4 and the discharge line for Unit 4. Currently Units 1 through 4 utilize 464,000 (280,000 + 184,000) gpm resulting in a design approach velocity of 0.5 fps. With the installation of the new units, these values will be reduced to 330,000 gpm and 0.3 fps, respectively. The design (historic), actual (current), and projected specifications of the cooling water system at MBPP are summarized in Table 6.5-1. (See also Section 6.5 - Water Resources for additional water flow and thermal discharge information.)

The analyses of the modernized MBPP intake and discharge effects consider not only the existing cooling water system effects, but also the beneficial effects of lower combined-cycle design intake and discharge flows. The maximum existing MBPP Project discharge volume will be reduced by approximately 29 percent, as compared to Units 1 through 4. With design-based discharge temperature remaining at or below the plant's 20° F (11.1° C) delta-T, the plant's discharge plume will be smaller than past thermal plumes, at equal operating capacities and a 20 percent higher electrical output (see Section 6.5. - Thermal Plume Characteristics).

Modernization of the MBPP will very simply allow the facility to produce 20 percent more electricity using approximately 29 percent less cooling water. The approximate 29 percent reduction in the facility's cooling water intake requirements from present permitted levels reduces the number of intake entrained organisms and the size of the discharge thermal plume. Both changes represent reductions in any potential impacts of the modernized MBPP cooling water system effects on Morro Bay and Estero Bay marine habitats and species.

Prior studies related to NPDES permits at MBPP have demonstrated that the existing CWIS facilities represented the best technology available. The finding is based, in part, on the facility's low numbers of impinged juvenile and adult fishes and its location in an area of typically low larval fish diversity. A year-long impingement field study (September 9, 1999 through September 8, 2000) was recently completed to confirm species composition and abundance. It is certain that the potential number of organisms entrained by the modernized MBPP intake facility will be fewer due to the nearly 29 percent reduction in cooling water system design flows from historic operations. These lower flows will also result in lower intake velocities leading to a reasonable expectation of fewer numbers of impinged fishes and shellfish.

The analysis of the modernized MBPPs intake and discharge effects is based on information from recently completed and ongoing field studies (Table 6.6A-4) and a compilation of available background literature, results of completed MBPP intake and discharge studies, and cooling water system studies at other power plants. Sample collection from the 12-month survey of Morro Bay's larval fish populations that began in June 1999 will be completed in early December. However, eight months of preliminary data, give immediate insight into the composition and abundance of the bay's larval fish species assemblage. Impingement data from September 9, 1999 through August 18, 2000 were analyzed for this AFC application. The remaining three impingement survey results (August 19, 2000 through September 8, 2000) are currently being analyzed. Results from eight months of entrainment surveys and nearly 12 months of impingement surveys are summarized in Section 6.6A.2.1.2. Detailed reports discussing the methods, data analyses, and results of the 1999-2000 impingement and entrainment studies are attached as Appendices 6.6A-2 and 6.6A-3, respectively. Summaries of reports that have specifically dealt with the potential impacts of the MBPP intake and discharge effects are included. The review of available background literature on MBPP cooling water system effects identified a number of reports that can be used to predict potential effects and impact associated with modernization of the present facility. This literature, in combination with information from the ongoing field studies described herein, forms a substantial basis for the cooling water system impact assessment.

TABLE 6.6A-4

CONTEMPORARY MBPP COOLING WATER INTAKE AND DISCHARGE BIOLOGICAL STUDIES

DATE	TYPE OF SAMPLING CONDUCTED
June 1999 - December 2000	Entrainment and source water plankton tows
September 9, 1999 through September 8, 2000	Impingement study
August 1999	Qualitative resurvey of Morro Rock thermal effects
August 2000	Sand beach fauna thermal effects survey
September 2000	Subtidal benthic thermal effects survey
September-October 2000	Rocky shoreline thermal effects survey

Various studies have been conducted over the years in the vicinity of the MBPP. Several studies examined the thermal effects of the MBPP (Table 6.6A-5). This section summarizes the methods and results of relevant studies. Locations of these previously studied areas are presented in Figure 6.6A-9.

TABLE 6.6A-5

PREVIOUS COOLING WATER INTAKE AND DISCHARGE EFFECTS STUDIES CONDUCTED AT THE MBPP

DATE	TYPE OF SAMPLING CONDUCTED	SOURCE
March 1967-January 1968	Algal studies	North, 1969
November 22-24, 1971	Benthic grab sampling; otter trawl tows	PG&E, 1973
November-December 1971	Intertidal transect study	Adams et al., 1974
February 2-4, 1972	Benthic grab sampling; otter trawl tows; gill net sets	PG&E, 1973
February-March 1972	Intertidal transect study	Adams et al., 1974
March 1, 1972	Sinking and floating gill net sets	PG&E, 1973
May 10-12, 1972	Benthic grab sampling; otter trawl tows; gill net sets	PG&E, 1973
May-June 1972	Intertidal transect study	Adams et al., 1974
July-August 1972	Intertidal transect study	Adams et al., 1974
June–October 1974	Angler use and catch composition	Steitz, 1975
July 1977–December 1978	Impingement study	PG&E, 1982

To confirm the previous findings of no significant adverse effects on beneficial uses, the potential impact of the Project on the source water and receiving water aquatic resources, site-specific information is being collected on the composition and abundance of the fishes and selected crabs that are impinged and potentially entrained. Locations of sampling areas are presented in Figure 6.6A-11. In response to concerns expressed by the CDFG, the megalopal stage of all species of cancer crabs will be identified and enumerated from all processed entrainment and source water plankton samples. The megalopal stage of the introduced, invasive European green crab (*Carcinus maenas*), if present, will be enumerated in response to concerns regarding their presence. These data will be used to estimate the potential entrainment by the CWIS intakes and estimate proportional entrainment losses of source water larval fishes and cancer crabs. Summary findings of the 1999-2000 entrainment studies are presented in Appendix 6.6A-3. All impinged fishes, decapod crabs, mollusks, and sea urchins were identified, enumerated, measured, and weighed. Impingement rates, and biomass estimates determined from these data are presented in Appendix 6.6A-2.

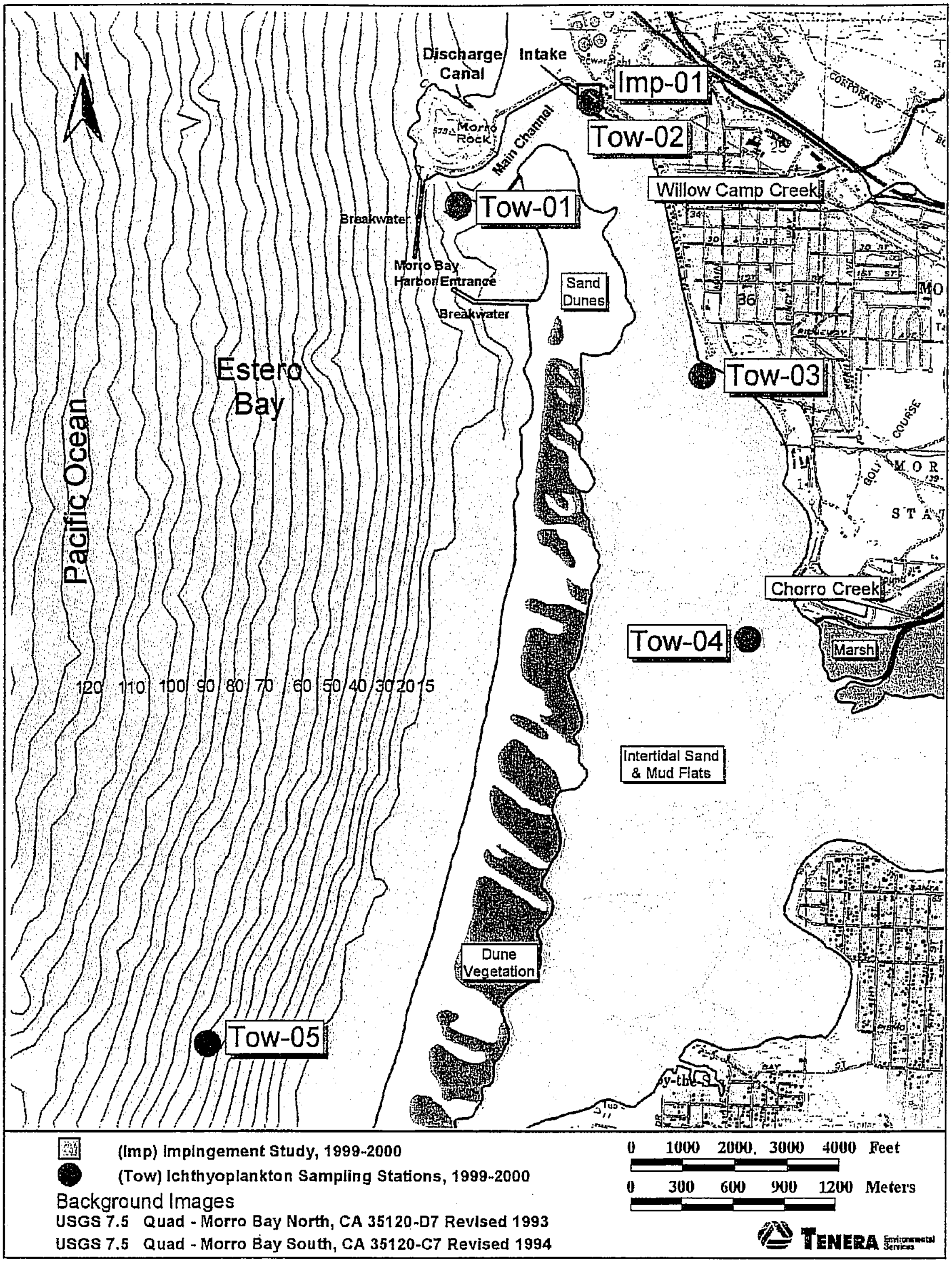


Figure 6.6A-11. Current entrainment and impingement study locations in Morro Bay.

Assessment of the MBPP Project's potential CWIS impacts is based on reports from past studies of the power plant's impacts and from contemporary studies mentioned above, including a year-long entrainment study that is nearly completed. Data from this study addresses questions regarding cooling water system intake entrainment effects. The entrainment study includes; (1) sampling in front of the intake; and (2) a source water component (sampling in the entrance to Morro Bay, an offshore location downcoast of the entrance to Morro Bay in Estero Bay, and in the back bay area of Morro Bay). A 12-month impingement study was completed on September 8, 2000. A biological survey of the MBPP discharge effects on algae and invertebrates located on Morro Rock and fishes observed in the vicinity of the rock was completed August 7 and 9, 1999. The results of this survey are included in the report in Section 6.6A.2.1.2. A survey of the sand beach habitat near the MBPP discharge was completed on August 2, 2000 and the preliminary findings are discussed in Appendix 6.6A-6. Subtidal benthic sampling was conducted in September 2000 and the preliminary results from that survey are attached as Appendix 6.6A-7. Quantitative intertidal surveys of the rocky shoreline near the MBPP discharge were conducted in September and the results from those surveys are currently being analyzed. A study plan (MBPP Modernization Project Thermal Discharge Study Plan), written with guidance from the TWG, contains descriptions of the three biological studies and is attached as Appendix 6.5-1.

A thermal plume study completed in July 1999 was used to establish the size and nature of the existing discharge plume and to facilitate development of the contemporary thermal plume characterization study plan design (Appendix 6.5-1) for projecting the dynamics of the new plume under the proposed operating scenarios.

6.6A.2.1.1 Impacts to Morro Bay

<u>Thermal Impacts</u>

Current and past studies of the distribution and dispersion of MBPPs thermal plume found no case where the plume came back on shore south of Morro Rock and entered into Morro Bay. Temperature recorders placed in many locations at various depths in Morro Bay (see Figure 6.6A-1 and Section 6.5) since 1999 have continuously recorded water temperatures while the plant was operating at varying loads and flows. Data from these recorders have not detected increased water temperatures related to the thermal discharge in Estero Bay. The results of past MBPP thermal plume studies also demonstrated the absence of any possible thermal effects on Morro Bay's habitats. The reduced size of the modernized plant's thermal plume provides additional assurance that Morro Bay's sandy subtidal, intertidal mudflats, submerged aquatic vegetation, coastal and brackish marshes and rocky intertidal habitats will not be affected by the discharge.

Entrainment Impacts

The modernized power plant will withdraw cooling water through the existing facility's two adjacent intake structures (Units 1 and 2 and Units 3 and 4; Figure 6.6A-3). Organisms smaller than the 3/8-inch mesh of the traveling screen will be entrained into the plant's CWIS and returned to the receiving water. Entrainment rates are directly related to the volume of water withdrawn by the plant. Use of state-of-the-art combined-cycle technology for the Project reduces design seawater intake volume through the existing intake structures as part of the Project, thereby reducing entrainment losses by an estimated 29 percent. Mortality rate of fish larvae does not necessarily degrade the ecosystem productivity. Most marine organisms produce enormous numbers of eggs and larvae to compensate for the extremely high natural mortality typical of marine habitats. Populations studies have shown that losses of these early life stages are generally insignificant to the eventual number of surviving adults. A practical application of the phenomena is demonstrated by the managed harvest of natural populations that sustain 30 to 50 percent losses of adults arising from these early life stages without long-term effects. The entrainment study [316(b) Resource Assessment Study] was designed to evaluate potential impacts of the CWIS effects as a part of the NPDES permit.

Phytoplankton and zooplankton populations will not be impacted by the Project's CWIS because of their short generation times, wide geographic distributions, and high population regeneration potential. The risk of localized population changes are reduced by the tidal currents that continually replenish the phytoplankton and zooplankton populations in the vicinity of the MBPP. The 29 percent reduction in cooling water intake flows will reduce the numbers of entrained phytoplankton and zooplankton.

This section is prepared in response to State[(12)] and Federal[(13)] regulatory requirements to assess whether the Project's proposed CWIS represents best intake best technology available (BTA) for minimizing the modernization Project's CWIS effects.[(14)] Information from studies of the operating MBBP and its CWIS effects on marine resources are used to assess the potential impacts of the intake and evaluate CWIS alternatives. The present permitted MBPP CWIS complies with its NPDES permit with BTA based in part on the facility's 316(b) CWIS study finding of low

(12) Section 316(b); 33 USC §1326 - Electrical Generating and Industrial Cooling Intake Systems. The administering agency for the above authority is the Central Coast RWQCB with oversight provided by EPA Region IX.

(13) Ibid.

(14) EPA. Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing the Adverse Environmental Impact. EPA-440/1-76/0/59. 263 pp. 1976.

potential impact along a consideration of available intake alternatives to reduce effects at a reasonable cost. The modernization Project's TWG requested Duke Energy to conduct new studies of the MBPP CWIS and to use the contemporary information from these studies along with existing information to assess potential impacts of the Project on local marine resources and evaluate CWIS BTA. The majority of the work is summarized in this section and included as appendices to the application. The study's findings are used to analyze potential impacts and evaluate CWIS alternatives. A 316(b) report will be submitted to the RWQCB in early 2001 to provide findings for the draft NPDES permit that is expected in March 2001.

Current entrainment studies began in June 1999 and will be completed in December 2000. Results of eight months of sample collections are summarized below. A detailed report of the entrainment study including methods and results is in Appendix 6.6A-3. The Fourth Quarterly Report, submitted to the RWQCB, is attached as Appendix 6.6A-8.

The purpose of this study is to describe the composition and abundance of larval fishes and megalopal crabs that could be affected by operation of the MBPP CWIS. Entrainment studies were designed to estimate larval fishes and megalopal cancer crab losses due to passage through the CWIS (assumes 100 percent through-plant mortality). Source water studies were conducted to characterize the composition and abundance of the larval fishes and megalopae that could be entrained by MBPP. Larval gobies were the most abundant fishes entrained (56 percent) and that *Cancer antennarius* constituted the majority of the crab megalopae entrained (23.6 percent). The gobies were also the most abundant taxa in source water plankton samples making up approximately 91 percent of the most abundant larvae from within Morro Bay and approximately 10 percent of the most abundant larvae collected from Estero Bay. Brown rock crab *Cancer antennarius* clearly dominated collections from in and outside of Morro Bay (i.e., Estero Bay), constituting approximately 59 percent and approximately 99 percent, respectively, of the plankton collections from those stations.

Many marine organisms have planktonic forms that can be entrained in cooling water intake systems. The TWG overseeing these studies decided to focus on groups of representative target organisms; namely larval fishes and crab megalopae. From these two groups of target organisms, particular taxa were selected in concert with the TWG for further analyses on the basis of their abundance in the samples or on other considerations (e.g., protection status, economic value, ecological importance). These selections were also based on the availability of suitable life-history information to meet assessment model requirements and on criteria outlined in EPA Draft Guidelines (EPA, 1977). The TWG determined that several assessment approaches would be applied to the data for each taxon where possible yielding more robust and comparable impact assessments.

Three of the four numerically dominant larval fish taxa collected at entrainment and in the source water are commonly associated with nearshore, shallow habitats such as bays and estuaries (gobies, combtooth blennies, and Pacific staghorn sculpin). The fourth, northern lampfish, is a pelagic, midwater fish whose adults are rarely found near shore. The three bay/estuary species demonstrate distinct abundance trends that follow lunar tide cycles; their larvae are most abundant on outgoing and at low tides within the confines of Morro Bay. It also follows that entrained northern lampfish larvae abundance does not follow a tidal cycle since adult lampfish are found offshore in deep water, too distant to be affected by any MBPP entrainment effects.

Only one of the three most abundant bay/estuary fish taxa has any economic value. None of the gobies or blennies are recreationally or commercially harvested, but Pacific staghorn sculpin is a shore-caught sportfish representing some undetermined level of indirect revenue in bait, tackle, and license sales. The tidewater goby *Eucyclogobius newberryi*, which has been reported to occur in the region of the MBPP, is a federally protected species. Population-level effects on this and the other entrained fish taxa have not yet been determined.

Four cancrid crab species constitute 92 percent of the crab megalopae entrained at MBPP. Brown rock crab numerically dominated these and the source water plankton collections during this study (i.e., 59 percent inside Morro Bay and 99 percent in Estero Bay). Their greatest abundance, during the Spring, corresponds to inferred spawning periodicity from other central California plankton surveys (Tenera Environmental, 2000). While brown rock crab are reported as annual spawners they occasionally have more than one batch per year (Carroll, 1982) accounting for the earlier peaks in entrainment abundance. Source water abundance appears to be unaffected by lunar tide cycle as could be expected given their high numbers both inside and outside of Morro Bay.

No significant entrainment impacts on Morro Bay's resident species are expected based on the small fraction (9 percent) (see Section 6.5.1.4.1-Tidal Prism and Appendix 6.5-3) of the bay's dynamic volume withdrawn for cooling purposes and the high reproductive capacity of the species. On a similar basis, it would be essentially impossible for MBPP entrainment to impact Estero Bay species. More detailed analyses of population-level effects of these entrainment losses will be determined using a combination of empirical estimates (Empirical Transport Modeling [*ETM*]) and demographic approaches (Adult Equivalent Loss [*AEL*] and Fecundity Hindcasting [*FH*]) for the RWQCBs NPDES permit and 316(b) assessment process. The *ETM* will use the source water samples to represent entrainment losses as fractions of the population at risk to entrainment in the source water. The *AEL* and *FH* models will predict and hindcast, respectively, the number of adults represented by the entrained early life stages. Larval abundance will be used to predict the number of adult equivalents they would have contributed to the population based on schedules of growth and survivorship (i.e., adult equivalent losses). Similarly, *FH* will hindcast the number of reproductively active adult females required to produce the number of larvae entrained. The use of these last two approaches depends on the availability of growth and survivorship estimates and, thus, may not be useful for taxa lacking this information.

Impingement

Organisms larger than the 3/8 inch mesh of the traveling screens that are weak swimmers or otherwise unable to avoid the intake may be impinged. Not only does the modernized facility significantly reduce design intake volume, the "approach to bar rack" velocities are also reduced (Section 6.5) thereby minimizing impingement rates of juvenile and adult fishes and shellfish. The existing Units 1 and 2 and Units 3 and 4 "approach to bar racks" velocities were measured in 1999 under full load conditions and maximum cooling water withdrawal. The existing Units 1 and 2 approach velocities of 0.37 fps will be reduced by approximately 10 percent (to 0.33 fps) for the new combined-cycle unit during peak load. An even greater reduction in the approach velocities (approximately 40 percent) will occur at the Units 3 and 4 intake from the current 0.51 fps to 0.30 fps for the combined-cycle unit during peak load. Even with this reduction in approach velocities, fishes and shellfish larger than the 3/8-inch screen mesh will be impinged. Results from the 1999-2000 and the 1978-1979 MBPP studies are summarized below.

A 12-month impingement study was completed on September 8, 2000. A detailed report of the 1999-2000 impingement study including methods and results is in Appendix 6.6A-2. Data from surveys conducted from September 1999 through August 18, 2000 were analyzed for this AFC. Additional survey data collected after August 18, 2000, are currently being processed and findings will be provided in the Draft 316(b) Resource Assessment. Methods for impingement sample collection and processing were patterned after the earlier impingement study (PG&E, 1982).

1999-2000 Impingement Study

Weekly samples were conducted at the MBPP Units 1 and 2 and Units 3 and 4 intake structures. Species composition, abundance, and biomass of fishes and invertebrates were measured.

The total estimated impingement losses at MBPP between September 6, 1999 and August 18, 2000, (expanded by using the 24-hour impingement data and the plant's actual weekly cooling water flow volume) was around 74,000 fishes weighing 1.2 metrictons and around 47,000 macroinvertebrates weighing 0.3 MT.

A variety of the fishes and invertebrates impinged at MBPP have some commercial or recreational value either as food for human consumption, reduction, live bait, or sport catch. The Pacific States Marine Fisheries Council (PSMFC) places many of these fishes into broad groups (i.e., all rockfishes) and treats some individual taxa (e.g., cabezon, lingcod, and kelp greenling) when reporting statewide fish landings (Table 6.6A-6). Using these taxonomic groupings for fishes impinged at MBPP and for which PSMFC reports landings, it becomes apparent that the economic impacts of impinged fish losses at MBPP are small. Other taxa impinged at MBPP with some economic value for which no landings data are available are the surfperches (approximately 1 percent by number of the fishes impinged), California scorpionfish (less than 1 percent by number of the fishes impinged), and Pacific mackerel (less than 1 percent by number of the fishes impinged).

Seven of the invertebrate taxa impinged during the course of this study have some commercial value (Table 6.6A-7). For the cancrid crabs, price per kilogram ($/kg) was estimated by averaging Morro Bay landings and dollar values between 1989 and 1998 from CFDG data. For *Upogebia pugettensis* and *Pandalus platyceros*, the landings and dollar values for the market categories "Ocean Shrimp" and "Prawns" were combined and averaged over the same period as above. No landings of market squid in Morro Bay were available, but a $/kg was estimated from Starr et al. (1998). As with the fishes, the projected dollar losses to the local fishery associated with MBPP impingement losses for these species are low.

Many of the taxa that occur in local waters but are not impinged have some aspect of their life histories which provides refuge from entrapment in the plant's cooling water system. Animals that are impinged are often the early life that are weak swimmers or not yet fully developed. Thus fishes and invertebrates whose early life stages progress in habitats outside of Morro Bay (e.g., rockfishes) substantially reduce their risk of impingement. Animals that are small and weak swimming as adults are less likely to be impinged in large numbers if their habitat preferences (e.g., pelagic or benthic environments) place them in areas away from the power plant intake (e.g., northern anchovy, market squid). Finally, some organisms are found primarily in bays and

TABLE 6.6A-6

APPROXIMATE DOLLAR VALUE OF ESTIMATED IMPINGEMENT LOSSES FOR SELECTED TAXONOMIC GROUPS OF FISHES AT MBPP DURING THE SURVEY PERIOD (SEPTEMBER 6, 1999-AUGUST 18, 2000)

Based on data from the Pacific States Marine Fisheries Council's (PSMFC) Pacific Fisheries Information Network (PacFIN) and Recreational Fisheries Information Network (RecFIN) internet databases unless otherwise noted.

TAXONOMIC GROUP	ESTIMATED # IMPINGED FOR SURVEY PERIOD	ESTIMATED WEIGHT (kg) IMPINGED FOR SURVEY PERIOD	1999 LANDINGS AT MORRO BAY PORTS (MT)	1999 EX VESSEL VALUE IN MORRO BAY PORTS ($)	APPROXIMATE VALUE ($) OF ESTIMATED IMPINGEMENT LOSSES AT MBPP	APPROXIMATE VALUE ($) OF ESTIMATED IMPINGEMENT LOSSES AT MBPP EXTRAPOLATED TO FISHERY-SIZED INDIVIDUALS
Rockfishes	203	14.52	397.2	$1,077,900	$39	$1,800
Kelp greenling	39	1.45	1.6	$13,400	$12	$200
Lingcod	218	1.45	13	$25,700	$3	$2,900
Cabezon	294	18.32	42.3	$517,400	$224	$3,600
Barred surfperch	78	0.47	NA	NA	$2	$200
				Grand Total:	**$280**	**$8,700**

NA=Not available.

TABLE 6.6A-7

APPROXIMATE DOLLAR VALUE OF ESTIMATED IMPINGEMENT LOSSES FOR SELECTED TAXONOMIC GROUPS OF INVERTEBRATES AT MBPP DURING THE SURVEY PERIOD (SEPTEMBER 6, 1999-AUGUST 18, 2000).

Based on data from the California Department of Fish and Game unless otherwise noted.

TAXONOMIC GROUP	ESTIMATED # IMPINGED FOR SURVEY PERIOD	ESTIMATED WEIGHT (kg) IMPINGED FOR SURVEY PERIOD	AVERAGE (1989-1998) LANDINGS IN MORRO BAY (MT)	AVERAGE (1989-1998) EX VESSEL VALUE IN MORRO BAY ($)	APPROXIMATE VALUE ($) OF ESTIMATED IMPINGEMENT LOSSES AT MBPP	APPROXIMATE VALUE ($) OF ESTIMATED IMPINGEMENT LOSSES AT MBPP EXTRAPOLATED TO FISHERY-SIZED INDIVIDUALS
Cancer Crabs			145.97	$385,600	$200	$6,310
Cancer antennarius	2,630	56.70				
Cancer anthonyi	214	1.54				
Cancer productus	531	10.16				
Cancer magister	237	2.04				
Shrimp and Prawns			193.41	$1,070,200	$4(1)	NA
Upogebia pugettensis	12	0.12				
Pandalus platyceros	7	0.55				
Loligo opalescens	15,983	36.15	none	none	$100(2)	NA
				Grand Total:	**$304**	**$6,310**

NA=Not available.

(1) This value is a first approximation which combined and averaged the market categories of "Ocean Shrimp" and "Prawns".

(2) The $/kg ($3.20) is based on the 1994 market squid catch in Monterey Bay National Marine Sanctuary ports (Starr et al., 1998).

estuaries (e.g., silversides) and are often impinged. However, these organisms have other life history adaptations (e.g., fast growing, high fecundity, competent young) which allow them to sustain this added source of mortality while maintaining healthy population levels.

Previous studies in and around Morro Bay indicate that the fishes impinged at MBPP are representative of the majority of fishes available from the surrounding habitats. In CFDGs otter trawl study of Morro Bay (initiated in 1992), very few of the top 25 species they have collected (e.g., vermilion rockfish and California halibut) have not been impinged during the survey at MBPP. Similarly, nearly all of the invertebrates impinged at MBPP are represented in CFDG otter trawl collections (CFDG unpublished data). The ten most abundant fish taxa collected by Fierstine et al. (1973) at various sites within Morro Bay (including near the harbor mouth) contain only two species not impinged at MBPP; diamond turbot *(Hypsopsetta guttulata)* and the tidewater goby *(Eucyclogobius newberryi)*. By contrast, several gobies collected by Horn (1980) near Baywood in southern Morro Bay did not occur in the impingement collections. These fishes are burrow dwelling and favor shallower, lower energy habitats which are found farther from the harbor mouth.

Prior studies of the MBPP CWIS intake effects demonstrated that the existing facilities represented the best technology available. Pacific Gas and Electric Company (PG&E) conducted a study in compliance with Section 316(b) of the CWA (PL 92-500 and 95-217) which required that the location, design, construction, and capacity of MBPP cooling water intake structure reflect the best technology available for minimizing adverse environmental impact. The study plan, based on state and federal 316(b) guidelines, was reviewed by several government agencies, including staffs of the RWQCB, State Water Resources Control Board, CDFG, and the EPA. The RWQCB decided that site-specific studies documenting the numbers of organisms entrained or impinged were not required for the MBPP because the facility was judged to be a low impact facility. The RWQCB staff concluded that results of extensive entrainment and impingement studies that were to be conducted at the Moss Landing Power Plant were sufficient to provide a basis for extrapolation to MBPP. An impingement monitoring study conducted at MBPP between July 1977 and December 1978 (PG&E, 1982), provided further information upon which an evaluation of the MBPP cooling water intake system could be based. Although entrainment studies were not required to be conducted at this site, entrained organisms were expected to include the planktonic eggs and larvae of fishes and invertebrates of species that spawn in open coastal waters and Morro Bay, such as flatfishes, gobies, rockfishes, shiner perch, and cancer crabs.

Based on laboratory tests, fish larvae, fish eggs, and macroinvertebrates exhibited a significant level of overall entrainment survival at the Moss Landing Power Plant. Striped bass at Sacramento San Joaquin power plants have entrainment survival rates as high as 80 percent depending upon operating conditions (PG&E, 1980). The number of fish and macroinvertebrates impinged was monitored at Units 3 and 4 of the MBPP (PG&E, 1982) between July 1977 and December 1978. In their review, PG&E found no evidence that entrainment and impingement losses have adversely affected general trends in species abundance and species composition of the local populations. Units 1 and 2 had been in operation for 28 years (Units 3 and 4, 20 years) with no evidence or indication of adverse effects on the fish and invertebrate populations inhabiting Morro Bay or Estero Bay. They based their conclusion on their analysis of commercial and sport species landings and results from a number of monitoring surveys near the plant (e.g., Fierstine et al., 1973; PG&E, 1973).

The finding is based, in part, on the facility's low numbers of impinged juvenile and adult fishes and its location in an area of typically low larval fish diversity of enclosed bays. With the possibility that changes over time have altered the species composition and abundance of impinged organisms, impingement field studies were initiated in September 1999 to investigate this possibility and provide a present-day baseline of any intake effects. Results from the impingement studies from September 6, 1999 through August 18, 2000 are discussed in Appendix 6.6A-2. Regardless of any differences we might find, it is certain that the potential number of organisms entrained by the modernized MBPP intake facility will be fewer due to the approximate 29 percent reduction in cooling water system design flows. These lower flows will also result in lower intake velocities leading to a reasonable expectation of fewer numbers of impinged fishes and shellfish.

<u>1977-1978 Impingement Study (PG&E, 1982)</u>

An impingement study was conducted at MBPP to provide data for as part of the 316(b) exemption demonstration program at Morro Bay and for use at the NRC licensing hearings for Diablo Canyon Nuclear Power Plant and (PG&E, 1982). Species composition, abundance, and biomass of fishes and invertebrates were measured. The influence of such factors as season, tide direction and displacement, debris load in source water, light and dark, unit load, and screenwash frequency were analyzed with a multivariate approach.

Impingement studies were conducted during high load power plant operating conditions comparable to those proposed and under a wide variety of seasonal biological and oceanographic conditions. Ninety-six 24-hour samples were collected between July 1977 and December 1978 from Units 3 and 4. Nine samples were collected between July and October 1978 from Units 1 and 2. Eighty-eight species of fishes and 206 macroinvertebrates were identified.

Five species comprised 86.5 percent of the total 18-month catch (N = 20,398). These were in order of abundance, shiner perch *Cymatogaster aggregata*, northern anchovy *Engraulis mordax*, bocaccio *Sebastes paucispinis*, plainfin midshipmen *Porichthys notatus*, and topsmelt *Atherinops affinis*. The estimated impingement loss of these five species totaled 51,163 fishes during 6 months of 1977 and 80,977 fishes during 1978. Estimated impingement loss for all 88 species was 62,681 for 6 months of 1977 and 95,765 fishes for 1978.

Units 3 and 4 were shown to impinge a significantly greater number of fishes than Units 1 and 2. There was a significant increase in nighttime impingement over that of daytime. Impingement was also greater on the ebb tides. The influence of debris loading and other physical variables and their possible interactions were discussed.

Data from the MBPP impingement studies were reanalyzed to cover a 1-year period so as not to duplicate seasonal catches (PG&E, 1982). Table 6.6A-8 summarizes the numbers, weights, and percentages of fishes and macroinvertebrates impinged at Units 3 and 4 of the MBPP from January 1978 through December 1978. Macroinvertebrates impinged in highest numbers were rock crab, yellow crab, market squid, red rock crab, and bay shrimp. Annual biomass was estimated based using impingement data collected from Units 3 and 4 from January through December 1978 (Table 6.6A-9).

6.6A.2.1.2 CWIS Impacts to Estero Bay

Taxonomic composition of the larval assemblage entrained at MBPP is more similar to that recorded from source water stations within Morro Bay than to the larval assemblage in Estero Bay. However, since the intake location is near the harbor mouth, both pelagic and bay/estuarine species are entrained so that the taxonomic diversity is slightly higher at the intake structure when compared with other stations within Morro Bay. Most notably, only a few taxa dominate the plankton samples collected at the intake structure (i.e., gobies, combtooth blennies, Pacific staghorn sculpin, and northern lampfish; these species comprise approximately 85 percent of the larval fish abundance entrained) and the Morro Bay source water samples (gobies, Pacific staghorn sculpin, and jacksmelt, which comprise approximately 94 percent of the larval fish abundance in the source water), but dominance is more evenly distributed in the Estero Bay larval assemblage: 16 taxa

TABLE 6.6A-8

NUMBERS, WEIGHTS, AND PERCENTAGES OF SELECTED FISHES AND MACROINVERTEBRATES COLLECTED IN IMPINGEMENT SAMPLES AT UNITS 3 AND 4 OF THE MBPP, JANUARY-DECEMBER 1978

COMMON NAME	SCIENTIFIC NAME	NUMBER	PERCENT	WEIGHT (kg)	PERCENT
Fishes					
Shiner perch	*Cymatogaster aggregata*	5,419	34.3	27.2	7.5
Northern anchovy	*Engraulis mordax*	4,164	26.5	39.4	10.8
Plainfin midshipman	*Porichthys notatus*	2,025	12.6	127.7	35.1
Topsmelt	*Atherinops affinis*	1,370	8.7	35.8	9.9
Bocaccio	*Sebastes paucispinis*	1,104	7.0	11.4	3.1
California tonguefish	*Symphurus atricauda*	310	2.0	1.7	0.5
White croaker	*Genyonemus lineatus*	226	1.4	1.6	0.4
Rockfishes	*Sebastes* spp. (1)	256	1.6	4.1	1.1
Surfperches	Embiotocidae (2)	214	1.4	25.9	7.1
Other fishes		648	7.1	88.6	32.6
Total		15,736		363.4	
Macroinvertebrates					
Rock crab	*Cancer antennarius*	379	5.3	27.8	33.3
Yellow crab	*Cancer anthonyi*	194	2.7	23.1	27.6
Slender crab	*Cancer gracilis*	20	0.3	0.4	0.5
Jordan's crab	*Cancer jordani*	53	0.7	0.1	0.1
Dungeness crab	*Cancer magister*	5	0.1	1.4	1.7
Red rock crab	*Cancer productus*	96	1.3	14.7	17.6
Lined shore crab	*Pachygrapsus crassipes*	12	0.2	<0.05	0.1
California spiny lobster	*Panulirus interruptus*	1	<0.05	<0.05	0.1
Market squid	*Loligo opalesens*	122	1.7	1.0	1.2
Octopus	*Octopus* spp.	39	0.5	3.3	3.9
Bay shrimp	*Crangon nigicauda*	93	1.3	0.1	0.1
Other macroinvertebrates		6,155	85.9	11.7	14.0
Total		7,169		83.6	

(Source PG&E, 1982)

(1) Excludes bocaccio.
(2) Excludes shiner perch.

TABLE 6.6A-9

ESTIMATED ANNUAL BIOMASS (GRAMS PER MILLION CUBIC METER FLOW) OF IMPINGED FISHES AT MBPP UNITS 3 AND 4 BASED ON IMPINGEMENT DATA COLLECTED DURING JANUARY TO DECEMBER 1978

COMMON NAME	FAMILY AND SCIENTIFIC NAME	BIOMASS
Sardines and herring	Clupeidae	0.58
Anchovies	Engraulididae	467.83
Midshipman	Batrachoididae	1,622.84
Jacksmelt and grunion	Atherinidae	1,123.15
Rockfishes	Scorpaenidae	187.62
Sculpins	Cottidae	48.24
Croakers and white sea bass	Sciaenidae	19.79
Surfperches	Embiotocidae	683.63
Kelp bass and sand bass	Serranidae	0.18
Kelpfishes and fringeheads	Clinidae	6.64
Mackerel and bonito	Scombridae	<0.01
Butterfish	Stromateidae	14.49
Flatfishes	Pleuronectidae	32.17
Other bony fishes	Other Osteichthys	111.37
Sharks and rays	Chondrichthys	588.93
Total biomass (grams/million m^3)		4,907.46

(Source: PG&E, 1982)

comprise 90 percent of the larval fish abundance. This indicates that, despite overall similarities among the lists of taxa from the three sampling locations, the dominant species in Morro and Estero Bays are represented differently within their respective larval assemblages. From the list of larval fish taxa that occur in Estero Bay, flatfishes, white croaker, and rockfishes are harvested commercially and recreationally as adults and landed in Morro Bay. These three taxa are not numerically dominant either at the MBPP intake structure or in Morro Bay source waters. Therefore, it seems unlikely that entrainment losses of larval fishes at MBPP will lead to any marked or long-term population declines in the three commercially or recreationally important taxa collected as larvae from Estero Bay.

Results from the present impingement study at MBPP indicate that only five percent of the fishes and 25 percent of the invertebrates impinged during the survey are species with recreational or commercial value. The total predicted biomass losses for all fish and invertebrate taxa, including those with commercial and recreational value, is relatively small (1.5 MT annually) before reducing it further to consider only those species with monetary value. This biomass estimate, based primarily on juvenile and young of the year (YOY) fish and invertebrate weights collected during the study, may be representative of the ultimate contribution these young organisms would make to their adult fishery landings if survivorship and catchability are considered. For comparison, consider the 1999 commercial landings reported for all rockfishes landed at the Port of Morro Bay and in Port San Luis of approximately 397 MT (PSMFC PacFIN) or the landings of cabezon over the same period: approximately 18 MT (PSMFC PacFIN). Thus, assuming that the predicted biomass losses are representative of adult contributions to respective fisheries, it appears that impingement losses due to operation of MBPPs cooling water intake system would have little effect on commercially or recreationally important fish or invertebrate populations in the vicinity of Morro Bay.

Thermal Impacts

This section is prepared in response to State[15] and Federal[16][17] regulatory requirements to assess whether the Project's proposed CWIS discharge temperatures protect the receiving water beneficial uses of Estero Bay. Particular to both statutes is the requirement that CWIS discharge

(15) Water Quality Control Plan for Control of Temperature in Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan), Appendix A-3. The plan was established in conjunction with 40 CFR 316(a) for thermal discharges. It is administered by the Central Coast RWQCB.

(16) Section 402; 33 USC §1342; 40 CFR Parts 122-136. This federal permit requirement is administered by the Central Coast RWQCB, with oversight provided by the State Water Resources Control Board (SWRCB) and the EPA.

(17) Section 316(a); 33 USC §1326 - Thermal Discharges. The administering agency for the above authority is the Central Coast RWQCB with oversight provided by EPA Region IX.

temperatures meet numerical limits established in the 1972 Clean Water Act and other State policy for the designated facility type. Discharge temperatures may exceed these broad policy limits where it can be demonstrated, based on site-specific conditions, that the limits are "more stringent than necessary to assure the protection and propagation of a balanced indigenous population of shellfish fish, and wildlife in and on the body of water into which the discharge is made."(18) Due to the rapid dissipation and dispersion of the buoyant thermal plume, there has been a low potential for significant thermal impact. Information from studies of the operating MBPP and its CWIS effects on marine resources are used to assess the potential impacts of the proposed intake design and evaluate CWIS alternatives. The present MBPP CWIS discharge temperatures comply with its NPDES permit temperature limits for an existing facility. These limits and other water quality standards assure that the MBPP discharge temperature protects receiving water beneficial uses.

With the proposed reduction in the Project's discharge volume the low potential for thermal impacts will be even further reduced from any that may presently exist. The modernization Project's TWG requested Duke Energy to conduct new studies of the MBPP CWIS discharge plume and receiving water resources and to use this contemporary information along with existing information to assess the Project's potential impacts. In this case, to better define the potential benefits of the Project's reduction in permitted discharge volume to the receiving waters marine resources.

Detailed description and analysis of the Project's thermal discharge and plume characteristics are presented in previous Section 6.5-Water Resources. More detailed accounts and findings of specific studies are included in appendices to the application. Both the study's findings, potential impact analysis and alternative CWIS evaluation are used to produce a required Thermal Compliance report that is submitted to the RWQCB in fulfillment of the Project's revised NPDES permit application requirements.

This buoyant surface plume of seawater that is carried by winds and currents north into Estero Bay. Although the volume of the discharge will be approximately 29 percent smaller than presently permitted, the thermal plume will still contact the beach and Morro Rock in the vicinity of the shoreline discharge structure. (See Table 6.6A-10 for a description of plume contact.) Previous studies have reported little to no effect of the power plant's thermal discharge on receiving water fish and invertebrate populations. Although discharge temperature in the MBPP modified the rocky substrate community of marine organisms living in the facility's discharge canal and a short distance

(18) Section 316(a), 40 CFR Section 125, Subpart H.

TABLE 6.6A-10

AREAS OF POTENTIAL MODERNIZED MBPP THERMAL PLUME(1) CONTACT AND SUMMARY OF AVAILABLE THERMAL EFFECTS DATA

	Morro Bay	Estero Bay	Source of Information
THERMAL PLUME			
Shoreline Plume Contact	None.	Yes, Morro Strand State Beach and Morro Rock at point of discharge. Plume rapidly mixed in surf zone.	Predictive model based on plume studies (DENA, 2000; TRC, 1999; and PG&E, 1973).
THERMAL EFFECTS			
A. Water Column Larval Fishes (ichthyoplankton)	No plume contact.	Minor plume contact.	MBPP predictive model using MLPP Units 1 through 5, Units 6 and 7 1999 plume study results.
B. Water Column Adult Fishes (pelagic fishes)	No plume contact.	Minimal contact with surface plume.	Observations made during 1999 and 2000 surveys. Predictive model based on Estero Bay study (PG&E, 1973).
C. Ocean Bottom (benthos)	No plume contact.	Shoreline discharge forms buoyant surface plume not in contact with benthos.	Subtidal benthos study (September 2000)
D. Sandy Beach	Not applicable.	Yes	Sand beach fauna study (August 2000 and predictive model of MBPP beach studies (PG&E, 1973)
E. Rocky Shore (Morro Rock, breakwater) Algae, Shellfish and Fishes	No plume contact.	Yes	August 1999 Morro Rock resurvey; September-October 2000 rocky shoreline thermal effects study, predictive model based on Morro Rock study (North, 1969), and rocky shore thermal effects and laboratory thermal tolerance literature.
F. Eelgrass (*Zostera marina*)	No plume contact.	Not applicable.	Not applicable.
G. Mudflats	No plume contact.	Not applicable.	Not applicable.
Marine mammals	No plume contact.		Thermal effects and zoogeographic literature.

(1) Assumes MBPP is operating at peak loads.

Study Locations are Found in Figure 6.6A-12.

beyond, the CWIS canal discharges directly into the high energy surf line of Estero Bay. Under the direction of Project's TWG representing the Commission, the RWQCB, CDFG, and California Coastal Commission, thermal effects studies were designed and undertaken that would update baseline conditions, verify previous findings and conclusions, and provide information to be used for the renewal of the plant's NPDES permit (see Figure 6.6A-12 for station locations). A survey of the rocky intertidal area of Morro Rock was completed in August 1999 and September 2000. A survey of sand beach fauna near the MBPP discharge was completed in August 2000, and benthic samples were collected from just beyond the beach surf zone in September 2000.

Background

The nature of the MBPP discharge and its location is well designed to minimize biological effects on the receiving water habitats. Cooling water delta-T's below 20° F (11.1° C) are discharged at the surface into a turbulent surf zone. Mixing and dispersion is rapid as the plume spreads at the surface towards open water. The horizontal direction and buoyancy of the MBPP thermal plume causes it to rapidly separate from the ocean bottom and avoid potential impacts on benthic habitat in the area of the discharge. Vertical temperature profiles of the Units 1 through 4 thermal plume were collected when both units were operating at full capacity. Samples were also collected under varying tide conditions showed the absence of thermal discharge at depths greater than 2 to 3 m (7 to 10 feet) in a small area immediately in front of the point of discharge.

The results of these thermal plume studies are found in PG&E (1973). Results from additional recent surveys of the MBPP thermal plume (June 1999) are included in previous Section 6.5 - Water Resources. The results of both sets of studies demonstrate that these turbulently mixed and relatively low discharge temperatures contact the sandy beach, subtidal benthos, open water column and rocky intertidal and subtidal habitats in the area of the discharge. The methods and findings of studies on discharge effects are summarized by habitat.

Previous studies of the existing MBPP discharge effects found no statistically significant thermal effects on the area's sandy beach, open water, or sea floor habitats (North, 1969; PG&E, 1971, 1973; Adams et al. 1974; Steitz, 1975). Aerial infrared imagery was employed to map the extent of the surface discharge plume and to statistically compare its temperature to the densities and concentrations of marine organisms occupying these habitats. Although not statistically significant, trends of increase in both species composition and abundance have been identified in relation to increasing discharge temperature. Water currents and warmer temperatures created by the Units 1 through 4 discharge attract fishes to the offshore area of the discharge plume. It is common to find large numbers of topsmelt in the discharge plume. The discharge flow movement of particles may create a feeding advantage for these planktivorous species.

Temperature effects of the discharge thermal plume were clearly evident, however, in the abundance and species composition of seaweeds (attached algae) occupying rocky substrate on Morro Rock (North, 1969). An unavoidable consequence of the location of the discharge is that it directly contacts Morro Rock. However, the location also favors the rapid dissipation of discharge temperatures into the turbulent surf zone. The results of the SCUBA surveys show that signs of thermal effects disappear very quickly along a gradient away from the discharge. The potential size of the affected area, a small fraction of Morro Rock's rocky shore habitat, is projected to decrease with the nearly 29 percent reduction in the modernized MBPP discharge volumes.

A large synoptic study of the MBPP thermal discharges from Units 1 through 4 was conducted in 1971-72 (PG&E, 1973). (See Section 6.5 - Water Resources) Results from these applied research studies of discharge effects form the basis for a predictive model of discharge effects. The studies provide predictive information on the same habitats and species that might be potentially affected by the modernized MBPP reduced intake and discharge volumes. Field studies are currently being conducted to determine if the habitats, species composition, and diversity have significantly changed, and will also establish a new baseline for future monitoring.

A map of previous study locations (see Figure 6.6A-9), with respect to the MBPP intake and discharge areas, is presented to illustrate the geographic relevance of the findings and the intake and discharge conditions that existed during the study.

This report addresses the possibility of MBPP CWIS impacts from the perspective of the area's potentially affected marine habitat and their associated species. Table 6.6A-10 summarizes geographical areas of potential plume contact and habitat types. The habitats are illustrated in previous Figure 6.6A-6 and the location of habitats studied and the various investigators are illustrated in Figure 6.6A-8 a through i.

<u>Sandy Beach Habitat</u>

The Estero Bay's sandy beach habitat extends in a nearly continuous reach of approximately 10 miles from Cayucos to Montana de Oro, interrupted by Morro Rock and the entrance to

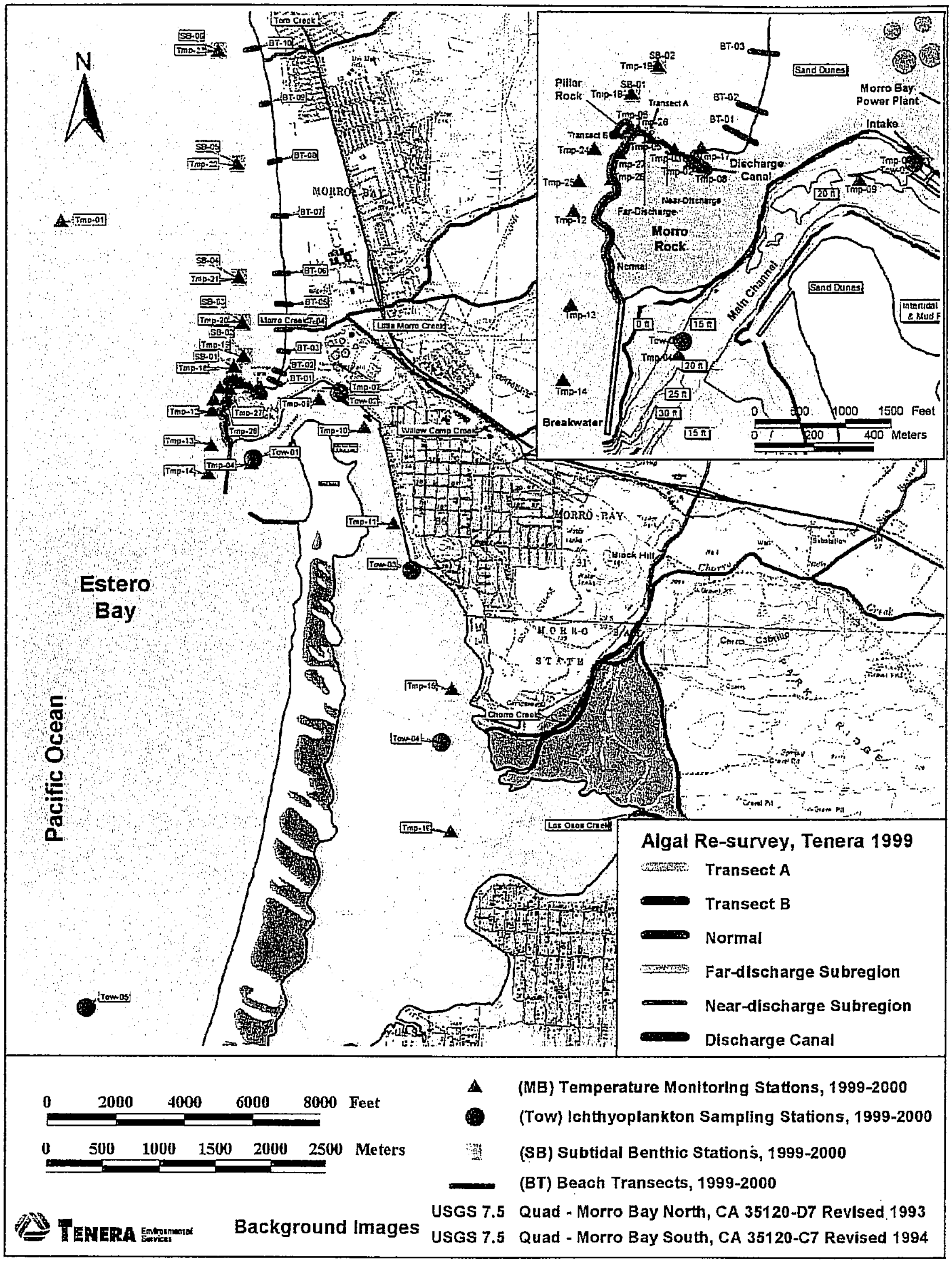


Figure 6.6A-12. Current thermal effects study locations, including locations of temperature recorders.

Morro Bay. Beach habitat in the area of Morro Bay is exposed to high-energy waves from the northwest. Large quantities of sand are annually transported on and off the beach shoreline by the strong waves and longshore currents found in this reach of the bay. The continuously changing nature of this habitat favors mobile invertebrate and fish species that adjust quickly to the depletion and accretion of beach sediments. Lacking stable substrate, attached organisms are unable to occupy this habitat, other than the scant hydroids and algae attached to Pismo clams protruding above the sandy bottom. Organisms of the sandy beach habitat are constantly moving and adjusting to their changing environment. Relatively few species are able to succeed in this habitat.

The most successful organisms are burrowers (such as bivalves and polychaete worms) and those animals that live in the surf zone and migrate up and down the beach according to the tidal cycle (sand crabs, amphipods, et al.). Some minute forms (e.g., harpacticoid copepods and isopods) also live among the sand grains in the surface layers. The three main macrofaunal groups represented in this habitat are polychaetes, molluscs, and crustaceans. Usually the dominant sandy beach taxa, in terms of numbers of species and individuals, are crustaceans. Most common in the Morro Bay area are two species of sand crabs *(Emerita analoga* and *Blepharipoda occidentalis),* a mysid *(Archaeomysis maculata),* isopods (especially *Cirolana harfordi),* and amphipods (beach hoppers; *Metopa* spp. and *Orchestoidea* spp.) (Berger, 1970).

Studies of the sandy beach habitat found no statistically significant effect of the existing Units 1 through 4 discharge and there is no reason to expect that the smaller discharge volume of the modernized MBPP will cause an effect. Sandy beach communities of worms, crustaceans and clams are adapted to a dynamic and unstable habitat of constantly changing tides, wave energy, and sediments. In addition to the unlikely possibility of detecting thermal plume effects in these constantly changing populations, the sandy beach habitat immediately inshore of the thermal discharge is designated for use as a long-term dredge spoil disposal site. The repeated disturbance of dumping dredge spoils on the beach would obviate any possibility of detecting potential thermal effects in the affected beach populations. However the TWG requested a set of samples be collected from the habitat to update previous descriptions and to reexamine the possibility of MBPP thermal plume effects. The sampling was scheduled to occur between periods when the City of Morro Bay and the COE dispose of dredge spoils and discharge waste water effluent onto the beach habitat.

August 2000 Sand Beach Fauna Study

Elevated temperatures of the MBPP Project's discharge will contact the sandy beach immediately north of the power plant's shoreline discharge. Turbulent wave action at this surf zone discharge point rapidly mixes and disperses the discharge thermal plume. Buoyancy of the thermal plume separates the plume from bottom contact as a combination of wind and currents carry it along the shoreline north into Estero Bay. During the movement of the plume away from the discharge, it continues to float to the surface in an ever thinning layer. The effect of wave mixing on the thermal plume can be seen in aerial IR thermal images where the thermal plume appears to disappear as it comes in contact with the surf zone and beach.

A survey of the sand beach habitat was conducted in August 2000. Previous studies used elements that would be applicable for testing spatial and temporal changes in the sand beach fauna adjacent to the MBPP discharge. The dynamic physical nature of the beach habitat results in a high degree of spatial and temporal variation in the fauna. For example, sand crabs are patchily distributed and can move either up or down the beach face in response to tidal height and wave exposure, and along the shoreline in response to changing beach morphology (Dugan et al., 1994). Therefore, any sample design sensitive to environmental effects such as changes in discharge characteristics must be robust enough to partition out variance due to natural factors. Stratified random designs can often overcome these difficulties and allow testing with an analysis of covariance (ANCOVA) to identify significant spatial or temporal changes in the sand beach fauna that covary with discharge plume temperatures contacting the beach habitat. Based on the results of previous MBPP thermal plume studies (PG&E, 1973) effects of the warm-water discharge on the sand beach community, if any, are expected to diminish rapidly with distance from the point of discharge. In August 2000, beach fauna was sampled at fixed intervals along vertical transects located at increasing distances from the MBPP discharge. Additionally, four replicate samples were collected along horizontal transects at the high, middle, and lower tidal elevations to allow an estimate of within area variation.

Transects were established at increasing distances along the beach upcoast from the discharge canal which encompasses a range of sites with varying amounts of plume contact. Water temperatures were continuously recorded in the MBPP discharge canal over the survey period in early August 2000, and also recorded for a 5 minute period in the wave wash zone at each transect at the time of field sampling. The sampling sites were similar to those used in the earlier study (Adams et al., 1974). Changes associated with increased temperatures (or theoretically with distance from the discharge) would be reflected as a gradient in the abundance of organisms across beach areas contacted by the plume. Results from the randomly sampled horizontal transects will be tested (ANCOVA) for covariance with plume temperatures (both measured and extrapolated) and distance from the discharge as partitioned by respective tidal elevations (model strata). The closer spacing of transects nearer the plume will allow a finer-scale determination of potential discharge effects, particularly for proposed lower discharge flow.

Field Sampling Methods

The beach sampling protocol was adapted from methods developed by the National Park Service for monitoring sand beaches in the Channel Islands National Park (Dugan et al., 1990) and methods used previously along Morro Strand State Beach by URS (1973). A set of 10 vertical transects were sampled along the beach at increasing distances north of the MBPP discharge. A 20 centimeter (cm) × 20 cm (7.9 inch × 7.9 inch) core sample was taken every 10 m (33 feet) along the vertical transects from approximately the 0.2 m to +2.7 m MLLW (0.7 ft to +9 ft MLLW) tidal elevation. Three tidal elevations on each transect were sampled with additional replicate cores. Four additional core samples (20 cm diameter × 20 cm deep) were excavated at random points along each of the horizontal transects to determine an average density of organisms at each elevation. The position of each vertical and horizontal transect was measured using differential GPS. The elevations of the horizontal and vertical transects were measured with a surveyor's level using a known USGS benchmark for a reference elevation.

Samples were placed into labeled mesh bags with 1.5 mm (0.06 inch) stretch mesh diameter consistent with published methodology (Dugan et al., 1990). Concurrent with the infaunal core sampling, shorebirds were censured in the vicinity of each transect. The physical conditions recorded at each transect were: 1) water temperature; 2) sediment grain size; 3) elevations (feet MLLW); and 4) positions of all transects.

Organisms were identified in the laboratory to the lowest practical taxonomic level. Size frequencies were determined for all sand crabs (*Emerita analoga*) and Pismo clams (*Tivela stultorum*) collected in the samples. Lengths were measured to an accuracy of 0.1 mm using vernier calipers. The reproductive (ovigerous) condition of female sand crabs was also noted.

All ten beach transects were sampled during early morning low tides on August 1 and 2, 2000. A total of 226 faunal core samples and 30 sediment grain size samples were collected.

Water temperatures recorded during the sampling collection were warmest closest to the discharge, and coolest temperatures were measured at the sampling locations farthest away from the discharge structure. The warmest water temperatures recorded on the transects were 10-11° C (50 to 52° F) cooler than the concurrent discharge temperatures and 2.8° C (5° F) above ambient seawater temperature.

Results

The beach sediments were classified as poorly graded sand comprised of terrigenous mineral sands and small shell fragments. Generally, there were finer grain sizes at the higher elevations and coarser sand and shell debris at the lower elevations. Variation in the grain size was greater in the lower beach samples. The lower beach cores from Transects BT-02 and BT-05 had some of the coarsest material. Dredge spoils from past U.S. Corps of Engineers dredging of the Morro Bay navigation channel have been deposited within the beach study area and may have affected the natural sediment grain size composition.

Preliminary data from 71 core samples yielded 22 taxa comprised of several species of polychaete worms, crustaceans (isopods, amphipods, anomuran crabs, mysid shrimps), clams, and nemertean worms. In qualitative field observations, beachhoppers (*Megalorchestia* spp.) were abundant at all transects in the upper elevation zone, particularly beneath macrophyte wrack (*Macrocystis, Nereocystis,* and *Zostera*).

Infauna at the transect closest to the discharge (100 m; 330 feet upcoast) had seven taxa in common to the transect most distant from the discharge (3,100 m; 2 miles upcoast). At both sites the polychaete worm *Euzonus mucronata*, the isopod *Excirolana chiltoni*, the amphipods *Megalorchestia* spp. and *Eohaustorius* spp., and the polychaete *Nephtys californiensis* were common, although the abundance of the organisms varied between the transects. Other taxa were observed in the field near these two transects but were not collected in the core samples. These included sand crabs *Emerita analoga* and Pismo clams *Tivela stultorum.*

Discussion

Preliminary data from this survey of beach habitat quantified the densities of macroinvertebrates on Morro Strand State Beach upcoast from the MBPP discharge and characterized their relative abundances along ten transects. Details of study findings and analysis are presented in a report on the August 2000 study included herein as Appendix 6.6A-6. All of the common taxa reported in an earlier infaunal study (Adams et al., 1974, summarized below) were also recorded in this study. The macrofauna of open coast sand beaches is not particularly diverse compared to the fauna found in more protected intertidal soft-substrate habitats (Ricketts et al., 1985). Most of the common species were quantified by collecting and screening numerous sediment core samples, but some of the larger uncommon taxa, such as Pismo clams, were too patchy to perform a distributional analysis with this method. Microscopic fauna (meiofauna) is another faunal component of sand beaches that supports many of the larger predatory species, but these microscopic forms were not sampled in the present design. For the purposes of comparing differences in fauna in relation to the thermal discharge, however, the methods used adequately characterized the beach fauna within and beyond the influence of the MBPP thermal discharge plume.

A primary goal of this study was to evaluate the magnitude and extent of potential effects resulting from the existing MBPP cooling water discharge on the receiving water's sand beach habitat and resources. Because the faunal composition at the transect closest to the discharge did not differ substantially from the fauna at the most distant transect, it can be concluded that the discharge has had little effect at this time of the year on infaunal species composition. Abundances of sand beach infauna are known to be variable and quite patchy due to changing beach morphology (McLachlan and Hesp, 1984), sediment grain size composition (Jaramillo and McLachlan, 1993) and the responses of local populations to periodic tidal fluctuations (Donn et al., 1986; Craig, 1973). This patchiness was reflected in the relatively high variation in taxon abundance among replicate core samples collected only a few meters from one another. However, by comparing mean abundances of a few common taxa across all transects, it was evident that there were no trends that could be attributed to warmer water temperatures from the discharge.

Pismo clams were once abundant on central California beaches and supported a successful recreational fishery in the Morro Bay area (Leet et al., 1992). The fishery coincided with MBPP operations throughout the late 1950s and 1960s, but in the early 1970s the clam resources declined abruptly. Predation from the expanding population of southern sea otters was the cause of the decline (Wendell et al., 1986). Since that time, the CDFG has monitored clam abundance and population size structure on Morro Strand State Beach in winter months of each year on three vertical transects 1 to 3 km (0.6 to 1.9 mi) north of the MBPP discharge (Christine Pattison, CDFG, pers. comm., 2000). Unpublished data from CDFG show that clam populations have fluctuated from lows in the early 1990s to highs in the mid-1990s. The latest survey in winter 1999-2000 found intermediate abundances of clams. The mean shell length in this local population has been approximately 35 millimeter (mm) (1.4 inch) with few individuals exceeding 60 mm (2.4 inch). This is substantially smaller than the typical minimum fishery size of 100 mm (4 inch). Continued sea otter predation and variable recruitment have prevented the population from recovering to its earlier population levels.

In conclusion, previous thermal discharges from MBPP have not measurably affected macrofaunal invertebrate populations along the Morro Strand State Beach. Several factors independent of power plant operation, such as sea otter predation, dredge spoil disposal, and coastal runoff, are probably the most important disturbance factors affecting local benthic populations. Effects from an offshore wastewater discharge pipeline of the Morro Bay/Cayucos Sanitary District are very localized and do not affect beach resources (Marine Research Specialists, 1998). The reduction in the volume of the discharge (approximately 29 percent) of the modernized Project's should continue to protect the receiving water's beneficial uses of the sand beach habitat and its biological resources.

1971-1972 Sand Beach Fauna Study

Thermal effects studies of the Estero Bay sandy beach habitat extending north of the MBPP shoreline discharge were conducted by PG&E in 1973. The study examined the relationship of intertidal beach temperature to the total number of species, abundance of each species, and the diversity of species. The location of the survey stations is shown in Figure 6.6A-13. The sampling results of their beach survey which were statistically analyzed showed no statistically significant thermal effects of the Units 1 through 4 discharge under full load operating conditions. The study's conclusion of no statistically significant discharge effects is based on the findings reported in Adams et al. (1974) which are summarized below.

Sampling Locations

During the study five sites were sampled along ten transects at quarterly intervals (see Figure 6.6A-13) on the sandy beach near the MBPP discharge. The intertidal area extending 10,000 feet (1.9 miles; 3 km) northward from Morro Rock was divided into ten transect stations at various distances from the plant discharge. The first transect, Transect 0, was positioned on the beach approximately 100 m (330 ft) from the discharge. Starting from Transect 0, the next four transects were placed at 500-foot (152 m) intervals, the following two transects at 1,000-foot (305 m) intervals and the last three transects at 2,000-foot (610 m) intervals. Five sampling sites (labeled 0.1, 0.2, 0.3, 0.4, and 0.5) were established at 100 foot (30 m) increments along each of the transects. The five sampling sites were positioned between maximum and minimum tide levels, site 0.5 being the lowest tide level. The area sampled consisted of a uniform sandy beach with similar slope along the entire length of the grid. The transect design was comparable to a previous method used for studying sandy beach fauna by Pimental (1959), Clogston, (1969) and McIntyre (1970).

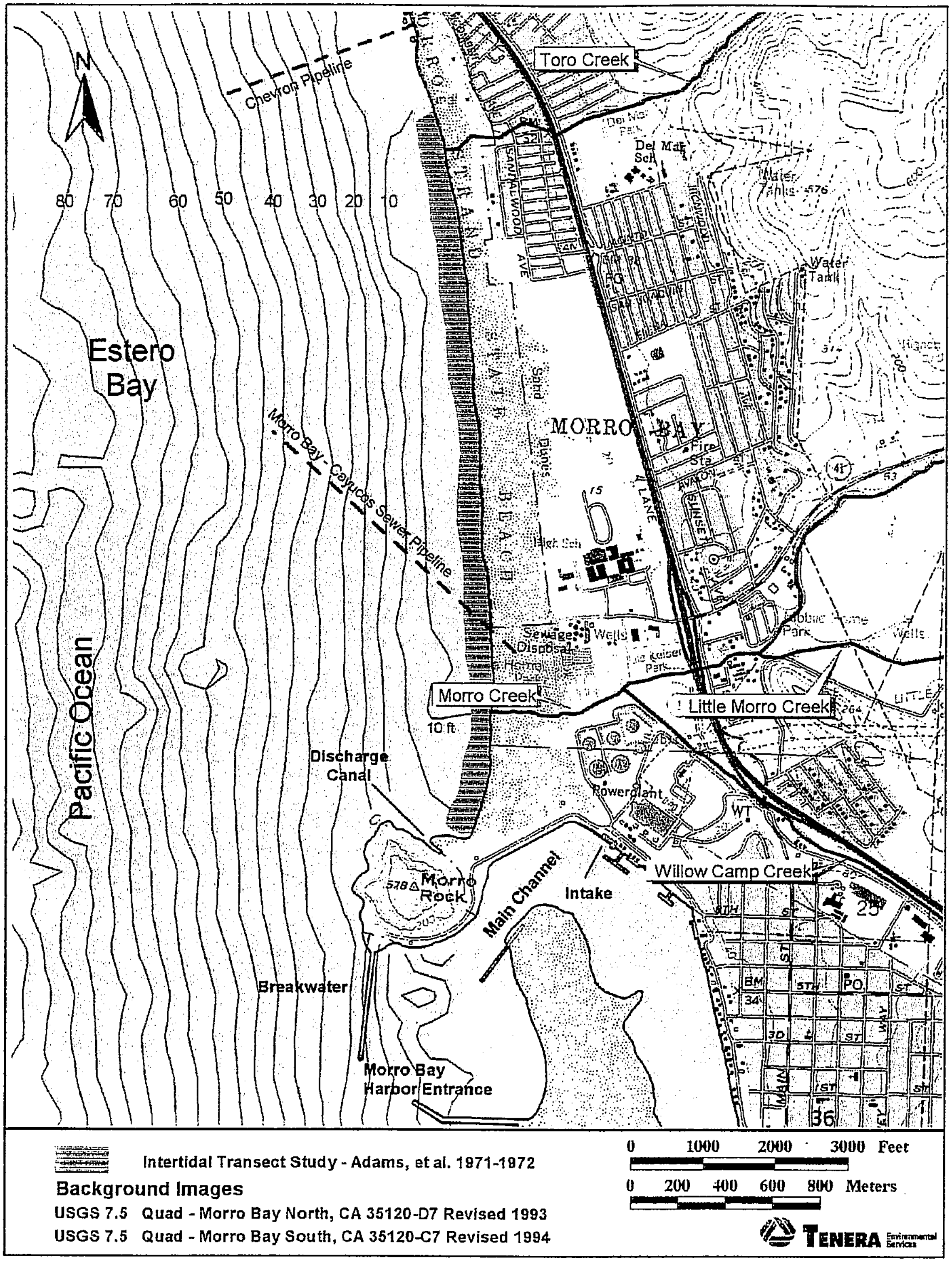


Figure 6.6A-13. Intertidal beach sampling locations from the 1971—72 survey (Adams et al., 1974).

Materials and Methods

One-third cubic meter (m^3) (11.8 cubic feet [ft^3]) of sand, divided into nine sub-samples consisting of 1/27 m^3 (13 feet x 13 feet x 13 feet) was sampled at each of the five sites. A total of 1-2/3 m^3 (58.9 ft^3) of sand was strained at each of the ten transects. Samples were sieved with ambient seawater through a 2-mm mesh screen. Organisms from the nine subsamples were combined for each site and identified in the laboratory to the lowest possible taxon.

Temperature measurements used were taken from 14 airborne infrared surveys conducted by PG&E over the period from 1963 to 1972. The intertidal transect stations were overlaid on each of the 14 images to obtain the corresponding temperatures. The average temperature was calculated for all ten transects; the transect with the lowest average temperature (Transect 10,000 at 58° F; 14.4° C) was defined as the ambient control station or delta T = 0. The delta-Ts above ambient for all other transects were calculated. Average temperatures ranged from ambient to 6.8° F (3.8° C) above ambient.

Qualitative Analysis

The intertidal stations were sampled during four quarters from 1971-1972: late November to December 1971, February to March 1972, May to June 1972, and mid-July to August 1972. During the four quarters of sampling, a total of 24,894 organisms were collected consisting of 63 taxonomic groups. Arthropoda comprised the majority of organisms collected (69.3 percent), followed by Polychaeta (28.1 percent), Mollusca (1.9 percent), and all others (0.6 percent).

The four most abundant species, in terms of numbers, were an unidentified amphipod (C1 in table), the polychaete *Thoracophelia mucronata*, the isopod *Exocirolana chiltoni*, and the sand crab *Emerita analoga*, comprising 88 percent of the organisms collected. The most commonly found organisms were the isopod *Exocirolana chiltoni* (found in 52.8 percent of the samples collected), the polychaete *Nephtys californiensis* (found in 51.7 percent), and the sand crab *Emerita analoga* (found in 47.7 percent). Ten species were categorized as dominant (50 or more individuals collected per quarter) comprising 97 percent of all animals collected. Table 6.6A-11 lists the distribution of these dominant species at each tide level. The upper beach (Stations 1 and 2) was dominated by the isopod *Exocirolana chiltoni*, the polychaete *Thoracophelia mucronata*, an unidentified amphipod, and the beach hopper *Orchestoidea corniculata*. The Pismo clam *Tivela stultorum* was more prevalent at lower tide levels (Stations 3 through 5) while the other species were irregularly distributed throughout the five tide levels.

TABLE 6.6A-11

NUMBER OF DOMINANT SPECIES COLLECTED AT EACH TIDE LEVEL FROM INTERTIDAL TRANSECTS AT ESTERO BAY: 1971 AND 1972

	NUMBER COLLECTED AT EACH TIDE LEVEL (SITE)					TOTAL
	1	2	3	4	5	
Unidentified Nemertean	32	80	29	9	6	156
Nephtys californiensis	17	88	135	89	59	388
Thoracophelia mucronata	3,181	2,986	2	0	0	6,169
Eteone dilatae	46	43	15	0	2	106
Exocirolana chiltoni	4,098	1,636	361	14	12	6,121
Orchestoidea corniculata	526	3	2	1	0	532
Unidentified Amphipod C1	1,010	7,664	49	60	28	8,811
Unidentified Amphipod D	207	383	157	3	10	760
Emerita analoga	39	367	85	282	58	831
Tivela stultorum	0	0	15	238	16	269
Total	9,156	13,250	950	696	191	24,143

(Source: Adams et al., 1974)

Data Analysis

The relationship of the delta-T with the diversity index, the number of individuals, and the number of species was determined by least squares linear regression analysis for transects by quarters, and for equivalent tidal stations by quarters (Table 6.6A-12). The maximum diversity index (3.8685) was found at Station 5 (lowest tide level) on Transect 6000. The minimum diversity index (0.5771) was found at Station 1, the highest tide level, on Transect 10,000. No significant correlations were detected in the analyses (Adams et al., 1974).

TABLE 6.6A-12

CORRELATION COEFFICIENTS FOR INCREASED TEMPERATURE VERSUS DIVERSITY INDEX, NUMBER OF ORGANISMS, AND NUMBER OF SPECIES FOR EACH QUARTER BY TRANSECT

	DIVERSITY INDEX	NUMBER OF ORGANISMS	NUMBER OF SPECIES
Quarter No. 1	.1955	.0990	.4354
Quarter No. 2	.3183	-.1369	.3648
Quarter No. 3	-.1787	.2417	.0410
Quarter No. 4	-.2146	-.0865	-.2660
Cumulative	.3651	-.1735	.2319

(Source: Adams et al., 1974)

8 degrees of freedom.

In the least squares linear regression analysis of temperature (° F) versus diversity index (tide level station by quarter), diversity was negatively correlated (P = 0.01) with temperature (r = -.7188) at Station 4 during Quarter 4. No significant correlations were detected for the other 23 data sets. Significant positive correlations with increased temperature were detected for the sand crab *Emerita analoga* and the polychaete *Thoracophelia mucronata* in the third quarter, May to June 1972 (Table 6.6A-13).

Discussion

Abundance of the polychaete *Thoracophelia mucronata* in Quarter No. 3 was positively correlated (P = 0.01) with temperature. Data from the study showed *Thoracophelia mucronata* had extremely clumped populations, a characteristic found in other studies by Dales (1952) and McConnaughey and Fox (1949). Adams et al. (1974) stated that the patchy distribution of this species and the large number of zero values in the data might suggest that the significant correlation was by chance. In addition, the small sample size of 10 had decreased the statistical power, thus affecting the above-discussed probabilities.

TABLE 6.6A-13

CORRELATION COEFFICIENTS FOR INCREASED TEMPERATURE VERSUS NUMBERS OF ORGANISMS OF EACH SPECIES FOUND IN EXCESS OF 50 INDIVIDUALS FOR EACH QUARTER BY TRANSECT

QUARTER NO. 1	
Nephtys californiensis	0.3183
Thoracophelia mucronata	-0.0288
Exocirolana chiltoni	-0.0654
Unidentified Amphipod D	-0.3210
Emerita analoga	0.5918

QUARTER NO. 2	
Unidentified Nemertean	-0.2071
Nephtys californiensis	0.0204
Thoracophelia mucronata	0.0220
Eteone dilatae	-0.2973
Exocirolana chiltoni	0.3592
Unidentified Amphipod D	-0.6007
Emerita analoga	-0.0716

QUARTER NO. 3	
Unidentified Nemertean	0.0986
Nephtys californiensis	0.4128
Thoracophelia mucronata	0.7843 **HS**
Exocirolana chilton	0.4646
Orchestoidea corniculata	-0.5034
Unidentified Amphipod C1	-0.6101
Unidentified Amphipod D	-0.1967
Emerita analoga	0.8067 **HS**

QUARTER NO. 4	
Thoracophelia mucronata	-0.4060
Exocirolana chiltoni	0.4539
Orchestoidea corniculata	-0.3100
Unidentified Amphipod C1	-0.4629
Unidentified Amphipod D	0.3750
Emerita analoga	0.2738
Tivela stultorum	-0.4144

8 degrees of freedom. HS = 1percent level of significance. All others nonsignificant. *(Source: Adams et al., 1974)*

A significant positive correlation between sand crab abundance and temperature was detected in Quarter No. 3. Aggregations of sand crabs are common and population abundance varied significantly from year to year. The sand crab occurred in 47.7 percent of PG&E study stations, but for all four quarters comprised only 3.3 percent of all organisms collected.

Intertidal organisms, particularly those in the upper tidal regions, have developed characteristics that enable them to tolerate environmental stresses, such as high temperatures. Adams et al. proposed that the effects of the thermal discharge on these intertidal inhabitants is "probably quite small" when compared to their normally harsh environment. Based on the parameters studied, Adams concluded the thermal impact of the cooling water discharge was statistically insignificant for the intertidal macroinvertebrate community adjacent to the MBBP.

The data show that the abundance and composition of organisms varied vertically across the beach profile within each transect. The maximum diversity was found at the lowest tide level sites, while the maximum number of individuals were found at the highest tide level sites. The beach environment is continually changing as a result of wind, waves, tides, and shifting sands. This introduced an unknown, but potentially large source of variation into the data. It is likely that these factors and the natural variability of the beach community would make effects of a thermal gradient difficult to detect.

Available Thermal Tolerance Data

Pismo Clams

Preliminary data from the August 2000 sand beach survey showed that there were no trends in abundance correlated with elevated temperatures from the MBPP discharge.

Surface plume temperatures from the modernized plant's discharge are not expected to negatively affect Pismo clams. The densities of Pismo clams in thermal studies of the Morro Bay shoreline discharge were found to increase in areas contacted by the thermal plume (Adams et al., 1974). The highest numbers of clams surveyed were located in beach habitat exposed to discharge delta-T degrees of 1.4 to 4.8° F (0.8 to 2.7° C). The authors reported findings consistent with observations that "warm-water" years have provided some of the best sets of young Pismo clams. There was no indication of detrimental effects of the power plant's thermal discharge from discharge temperatures 70.5 to 78.5° F (21.1 to 25.8° C) and delta-T's up to 20° F (11.1° C)and delta-T's of 6.8° F (3.8° C) measured on the beach.

Sand Crabs

Preliminary data from the August 2000 sand beach survey showed that there were no trends in abundance correlated with elevated temperatures from the MBPP discharge.

Dugan et al. (1994) reported the results of her studies on geographic variations in the life history characteristics of *Emertia analoga*. Water temperatures were inversely correlated with several life histories characteristics. As water temperature increased, the size of female crabs at sexual maturity, the largest ovigerous and smallest ovigerous females, and largest male crabs all declined. The remaining environmental variables tested, surf zone chlorophyll and sediment characteristics, were inconsistently correlated with life history characteristics over the 5-year study. Surf zone water temperatures varied geographically, ranging from 11.5 to 25.6° C (52.7 to 78.1° F). With the exception of geographic variations in life history characteristics, normal population levels of sand crabs were sampled within this temperature range. Based on the high thermal tolerance of sand crabs, the modernized plant's discharge is not expected to affect their population abundance or distribution in the sandy beach habitat contacted by the plume.

Sandy Subtidal Habitat

The habitat near the discharge structure is composed of sandy silts and clay. The discharge is located on the shoreline. The horizontal direction of the discharge and buoyancy of the thermal plume lifts and separates it from the ocean bottom and invertebrate species living on or in (epifauna or infauna) the sandy mud bottom (benthic) habitat.

September 2000 Subtidal Benthic Survey

Subtidal benthic samples were collected in September 2000 following the guidelines approved by the TWG. Subtidal benthic habitats, comprised of unconsolidated sediments such as sand and mud, can support diverse and productive assemblages of invertebrates and fishes. Fine sands are the predominant bottom type in the shallow waters of Estero Bay, adjacent to the MBPP. The benthic fauna can be categorized into epifauna, invertebrates occurring mainly on the sediment surface, and infauna, burrowing or sessile invertebrates occurring mainly beneath the surface. Warmer water temperatures, such as those discharged from MBPP could potentially affect this habitat by altering the abundances or reproductive characteristics of the faunal populations.

This report includes preliminary results from an initial subtidal faunal survey conducted on September 1, 2000. Additional surveys will provide data to evaluate seasonal changes in the assemblage of subtidal benthic fauna that may be related to discharge contact.

The MBPP discharges heated water from an onshore discharge canal located approximately 0.4 km (0.25 mile) west of Morro Bay harbor. Excess discharge temperatures rapidly dissipate in the surface layers of the receiving water due to buoyancy and mixing, and decrease northward along the beach and westward along Morro Rock. Although discharge temperatures fluctuate with changing electrical generation loads, Adams et al. (1974) reported that the average temperature increase in surface waters along the beach was approximately 2.0° C (3.6° F) at a distance of 0.3 km (0.19 mile) from the discharge and 0.5° C (0.9° F) at 1.0 km (0.62 mi) from the discharge.

Field Sampling Methods

Permanent sampling stations were established with concrete marker blocks at distances from 100 m to 3,000 m from the discharge along a -5 m [-16 ft] depth contour. This depth was determined to be the shallowest practical depth that a boat and divers could safely sample permanent stations due to the dangerous wave conditions that can occur along Morro Strand State Beach. Divers directly sampled the benthic fauna with a hand-held coring device rather than a boat-mounted grab sampler, which reduced the variation in sample volume between replicates. Divers could also visually census the epifauna at each station. Accurate GPS measurements allowed the stations to be relocated without the need for surface marker buoys, even in reduced water visibility conditions.

At each station, divers collected five core samples (15.5 cm diameter by 15.5 cm depth; approximately 6 inch by 6 inch). The samples were brought to the surface and sieved through a 1.0 mm screen. The residual fauna was preserved in 12 percent formalin and returned to the lab for sorting and identification. A sediment sample (5 cm diameter by 20 cm deep) was also collected at each station and analyzed for grain size distribution. Temperature data were recorded every 20 minutes at each station using a thermistor that was replaced during the sampling. The presence or absence of epifaunal taxa was noted within a radius of 5 m around the station during a timed 10 minute swim. Due to poor underwater visibility, visual censuses along measured transects were not practical.

Results

The initial survey was conducted on September 1, 2000 during a period of calm sea conditions. All six stations were sampled with a total of 226 faunal core samples and 30 sediment grain size collected. Temperature recorders were recovered from all stations.

Water Temperatures

Water temperatures at the -5 m MLLW depth from August 12-31, 2000 did not vary substantially among stations, with some of the coolest average temperatures (13.3° C) occurring at the stations closest to the discharge. If ambient temperatures at -5 m MLLW are referenced to Station SB-6, 3 km (1.86 miles) from the discharge, near-bottom temperatures as close as 100 m to the discharge were cooler than ambient. This phenomenon may be caused by an entrained counter-current along the bottom that would tend to bring cooler water toward the discharge from greater depths as the warmer surface waters flow in an offshore direction. At Station SB-1, divers noted a distinct thermocline at a depth of approximately 1 m (3.3 feet) below the surface, and an offshore surface current of approximately 0.5 kt. Temperatures fluctuated substantially at all stations during the 2-week period, from maximum temperatures slightly over 17.0° C to minimum temperatures of approximately 11.5° C. The average discharge temperature over this period was 25.7° C, ranging from 30.8° C to 17.8° C.

Sediment Grain Size

Subtidal sediments were similar between stations and were characterized as fine sands comprised of terrigenous minerals and small shell fragments. Laboratory results comparing the various size fractions by weight are pending.

Subtidal Fauna

Preliminary data from 30 core samples and from epibenthic observations yielded 30 taxa comprised of polychaete worms, nemertean worms, crustaceans (amphipods, crabs, shrimps), clams, echinoderms, and one species of fish. Most taxonomic groups occurred at all stations, with the greatest number of taxa (20) found at SB-1 and the least number of taxa (13) found at SB-4. Some of these taxa were combination categories comprising several species, so the actual number of species at each station was higher than reported.

Sand dollars (*Dendraster excentricus*) were present at all stations, but were particularly abundant ($< 700/m^2$) at Stations SB-3 and SB-4. An analysis of variance test revealed a highly significant difference in abundance among stations ($p < 0.001$) due to the high abundance of this species at the two stations. Their distribution among stations suggests that there was no gradient of abundance related to the thermal discharge at this depth. In addition, the individuals at these stations were substantially larger than at the other stations. By combining data from all stations, a size frequency distribution for the population reveals a distinctly bimodal distribution of adult and juvenile *D. excentricus* within the shallow Estero Bay area during September 2000.

The most abundant invertebrate in the core samples was the polychaete worm *Magelona pitelkai.* This is a small deposit-feeding worm that rarely exceeds 10 mm (0.4 inch) in total length.

M. pitelkai occurred at all stations except SB-4 and was most abundant at Station SB-1. An analysis of variance test revealed a highly significant difference in abundance among stations ($p < 0.001$) due to the high abundance of this species at Station SB-1.

Discussion

The shallow water infauna and epifauna adjacent to the MBPP discharge and at reference stations farther upcoast in Estero Bay is moderately diverse. Preliminary data from this study provide density estimates for several common species of amphipods, polychaetes, and echinoderms, and none of these taxa show strong gradients in abundance related to water temperature or distance from the discharge. Elevated water temperatures did not occur at any of the -5 m MLLW stations indicating that the buoyant thermal plume has no direct effect on this habitat. One of the most abundant species recorded in the study, the sand dollar *Dendraster excentricus*, had maximum abundances at a distance of 1,500 m from the discharge with lower population densities at stations to the north and south. A strong spatial gradient would be indicated by species abundances that logarithmically increased or declined with distance from the discharge.

In this study, the evidence suggests that the disturbance effect of *D. excentricus* is a significant factor controlling shallow water benthic community structure. In winter and spring, physical disturbance from wave large wave episodes probably also exerts a significant influence on the abundance and composition of the benthic fauna at the -5 m depth. Because there was no measurable increase in water temperature above ambient at any of the sampled subtidal benthic stations, and no gradients in faunal abundance with distance from the discharge, the evidence suggests that elevated water temperatures from the MBPP discharge do not have any measurable effect on shallow subtidal communities in Estero Bay. Future changes in MBPP discharge parameters should continue to protect the receiving water's beneficial uses of the shallow water benthic habitat and its biological resources.

1971-1972 Benthic Survey

Thermal effects studies of the Estero Bay subtidal benthic habitat in the vicinity of the MBPP shoreline discharge were conducted by PG&E in 1971 and 1972. The benthic sampling station locations are shown in Figure 6.6A-14. The ten stations were chosen so that sampling would occur in representative areas of the thermal plume; the discharge pathway, areas where surface waters were influenced by the discharge, and control areas. The locations, for ecological consistency, had similar substrate type, water depth, and wind/wave action exposure. Vertical temperature profiles of the Units 1 through 4 thermal plume were collected when all the units were operating at full capacity and discharging maximum volumes. Samples were also collected under varying tide conditions.

The benthic biological sampling occurred during three periods; November 22 to 24, 1971; February 2 to 4, 1972, and May 10 to 12, 1972. Benthic samples of the seafloor were collected using a 9-inch by 9-inch Ponar grab. Information recorded included the date, time, station, sample number, sediment temperature, sample volume, and water depth. Three replicate grab samples were collected at each of the 10 benthic stations. Samples were rinsed with seawater through a 0.5 mm stainless steel screen and preserved. Organisms were identified to species level when possible.

Table 6.6A-14 shows the water depths and surface temperature increments at each benthic station. Although surface temperatures were measured at each benthic sampling location, temperature data collected by aerial infrared imagery were used to compute delta-Ts for each sampling location. The water depths were corrected for tidal height differences to 0.0 feet tide level.

Margalef's diversity index was calculated for each sample and for each station by sampling period. The percent composition of the major groups (Mollusca, Crustacea, and Polychaeta) was calculated for each station by sampling period. A stepwise multiple regression program was used to test the relation between the diversity index and particle size, percent organic matter, water depth, and surface water temperature.

Results

Of the 116 species or taxa collected in the Estero Bay benthic survey, the most numerous taxa was an unidentified nemertean (49.4 percent). An unidentified amphipod, (C1) was the second most numerous at 16.9 percent. Of the 14,208 organisms collected, the C1 amphipod was also the most widely distributed, occurring in 84.4 percent of the samples. Also widely dispersed were the olive snail, *Olivella biplicata* (67.2 percent), amphipod C2 (67.2 percent), amphipod A (62.0 percent) and the moon snail, *Polinicies* spp. (58.6 percent). The rank order of major groups for all sampling periods was molluscs (25.9 percent), crustaceans (21.9 percent) and polychaetes (1.4 percent).

According to the study, the power plant influence seems to have no effect on the relative proportions of these groups (Mollusca, Crustacea and Polychaeta). In the second and third sampling periods, there was a larger proportion of Mollusca at the discharge station than in the first sampling period. In the second period, the data suggest an increase in the proportion of Mollusca at the sampling stations nearest the discharge.

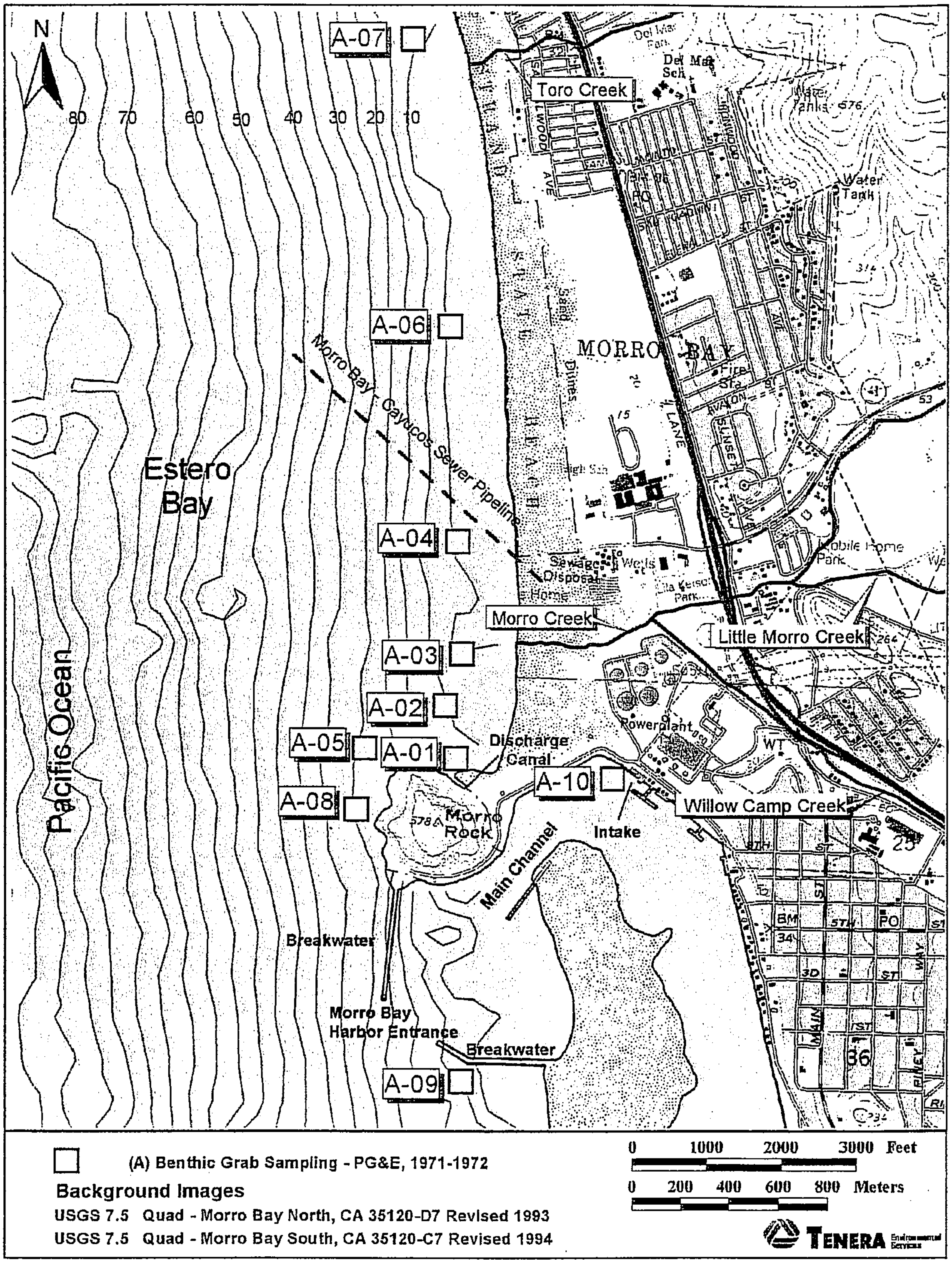


Figure 6.6A-14. Benthic sampling locations from 1971—72 survey (PG&E, 1973).

TABLE 6.6A-14

SURFACE TEMPERATURE MEASUREMENTS AT BENTHIC STATIONS AND CORRECTED WATER DEPTHS

	1	2	3	4	5	6	7	8	9	10
Average Temperature (° F)	69.9	65.7	63.0	60.1	64.4	58.8	58.1	57.4	57.2	57.2
Temperature Increment Above Ambient (° F)	12.7	8.5	5.8	2.9	7.2	1.6	0.9	0.2	0	0
Corrected Water Depths (feet)	8	17	15	14	18	9	10	23	17	15

(Source: PG&E, 1973)

Stepwise Multiple Regression Analysis

For November 1971, February 1972, and May 1972 combined, there were no significant correlations between the diversity index and any physical variable (median particle size, percent of particles in the 30 to 60 micron range, percent organic matter, water depth, and surface water temperature). This also held true for the individual sampling periods of February 1972 and May 1972. For November 1971, a positive correlation existed between the diversity index and water depth. Since the regression equation accounted for only 29.96 percent of the variance observed in the diversity index, it was not statistically significant.

The relationships between increased temperature and the diversity index, the number of species, and the number of individuals as shown by correlation coefficients are summarized in Table 6.6A-15. No significant correlations between the temperature change above ambient and the abundance or diversity of benthic organisms were found in any sampling period in the benthic survey.

TABLE 6.6A-15

CORRELATION COEFFICIENTS FOR DIVERSITY INDEX, NUMBER OF SPECIES, AND NUMBER OF ORGANISMS IN RELATION TO INCREASED TEMPERATURE

	November 23, 1971	February 2, 1972	May 11, 1972
Diversity Index	-0.1637 N.S.	0.4083 N.S.	-0.1553 N.S.
No. of Species	-0.3307 N.S.	0.1584 N.S.	-0.1069 N.S.
No. of Organisms	-0.2780 N.S.	-0.2780 N.S.	0.1108 N.S.
	n = 8	n = 9	n = 9

N.S. = Not Significant

(Source: PG&E, 1973)

Rocky Intertidal and Rocky Subtidal

The MBPP discharge plume comes in frequent contact with the rocky intertidal and shallow subtidal habitat associated with Morro Rock. The northern side of this prominent geologic feature at the point of discharge acts as an extension of the western side of the discharge canal. The underwater topography of the study area consists of a wall of rocks and huge boulders that slope steeply to a sandy bottom. Rock substrate is generally smooth with few crevices. The establishment of seaweed on rocky substrate in the area is inhibited by wave action. Temperature data and bathythermograph tracings (Cheney and Richards, 1966; PG&E, 1973) showed that in general, the MBPP thermal effluent dispersed into Estero Bay to the north and west of the discharge canal. Nearshore currents, wind, and tides influence the direction of the plume, as well as its dissipation. The west face of Morro Rock was rarely exposed to a delta-T of greater than 4 to 6° F (2 to 3° C). The thermoclines in the area were generally 3 m (9 ft) deep or less. Considerable variation in temperature was observed on the bottom during diving surveys at the end of the discharge canal. Water temperatures in this area are generally well below the upper temperature limits for most common invertebrate species and fish species easily come and go depending upon their reactions to water temperatures. However in general the most temperature sensitive seaweeds, which are more sensitive to water temperatures than invertebrates or fishes, are affected by temperatures as low as 17 to 18° C (63 to 64° F) (Tenera Inc., 1997).

A number of seaweeds species (attached macrophytes) found in Morro Rock's intertidal and subtidal habitats are sensitive to elevated ocean water temperatures. The diverse algal assemblages found along California's central coast reflect the geographical overlap of northern and southern California species. These overlapping species also exhibit temperature tolerances that reflect temperature regimes from their respective geographical regions. When these mixed northern and southern species assemblages are exposed to temperature gradient such as exists along the shoreline of Morro Rock, species gradients form that range from warm-tolerant species at the point of discharge to cool-tolerant species ambient water temperatures. Such a gradient in algal species was report by North (1969) from his SCUBA survey of Morro Rock and more recently by Tenera Environmental (1999 and 2000) from a repeated survey of North's study area. The findings of both reports show a clear gradient of changes in algal abundance and species composition away the point of MBPP discharge. These changes correlate to a number of environmental gradients such as temperature, sand scouring, light, and salinity.

Background information from surveys conducted in 1967-1968 is presented below followed by recent observations made in the same area in 1999-2000. A discussion of the changes observed during the recent survey is included.

1967-1968 Rocky Intertidal and Subtidal

The focus of the North (1969) study was the algal community of attached macrophytes within and in close proximity to the heated effluent MBPP discharge canal. The discharge canal is approximately 60 m (200 feet) long, 10 m (33 feet) wide and lined on each side with riprap. The maximum depth within the canal is about 4 m (13 feet).

North's study area was divided into three regions: the discharge canal, a transitional region, and a normal region (Figure 6.6A-15). The transitional region, which included Transect A, extended approximately 220 m (725 feet) along the northwest side of Morro Rock. Its width varied depending on the amount of rocky substrate present between the surface and sandy bottom. The normal region, which included Transect B, began at the border of the transitional region about 10 m (33 feet) from Transect A. Transect B was located 10 m from the transitional region border. Transects were oriented vertically on the rocky slopes. Rocky substrate within these regions was inspected using SCUBA. Outside the discharge canal, however, surf prevented observations shallower than 2 m (7 feet). Algal species lists were compiled for each region and the distribution and abundance of the more important species were estimated (Table 6.6A-16).

Transect Surveys

Two transects (A and B) were set up to study vertical zonation patterns of algal species on the northern exposure of Morro Rock. This area was the subject of study because it was located where warm effluent disperses along the surface and mixes with the underlying water. Since this warmer water forms a surface layer, thermal effects on vertical zonation were expected from the surface to depths of 2 to 3 m (7 to 10 feet). The study surveyed lateral changes in species composition/density and vertical shifts in normal zonation patterns downward.

TABLE 6.6A-16
SUMMARY OF ALGAL SPECIES PRESENT BY REGION

SPECIES	DISCHARGE CANAL	TRANSITIONAL REGION	NORMAL REGION
Chlorophyta			
Codium setchellii			X(1)
Ulva spp.			X(1)
Phaeophyta			
Laminaria setchellii		X(2)	
L. sinclarii			X(1)
Rhodophyta			
Aeodes gardneri			X
Agardhiella coulteri			X(1)
Ahnfeltia plicata			X
Calliarthron cheilosporioides			X(1)
Callophyllis flabellulata		X(2)	X(1)
C. heanophylla			X(1)
Cryptopleura violacea			X
Gelidium robustum			X(1)
G. coulteri			X
Gigartina volans			X(1)
Gracilariopsis sjoestedtii		X	X(1)
Gymnogongrus leptophyllus			X
Hymenena flabelligera			X
Iridaea flaccida			X(1)
I. lineare		X	X
I. splendens			X
Laurencia gardneri			X
Melobesia marginata		X	
Peyssonellia pacifica		XX(2)	X
Plocamium coccineum			X(1)
Polyneura latissima			X(1)
Polysiphonia brodiaei			X
Prionitis lanceolata		X(2)	X(1)
P. linearis			X(1)
Pterosiphonia dendroidea		X(2)	X(1)
Ptilota densa			X
Rhodymenia pacifica		X(2)	X(1)
Schizymenia epiphytica			X(1)
Spermatophyta			
Phyllospadis torreyi		X	X

(1) Noted along Transect B.
(2) Noted along Transect A.

(Source: North, 1969)

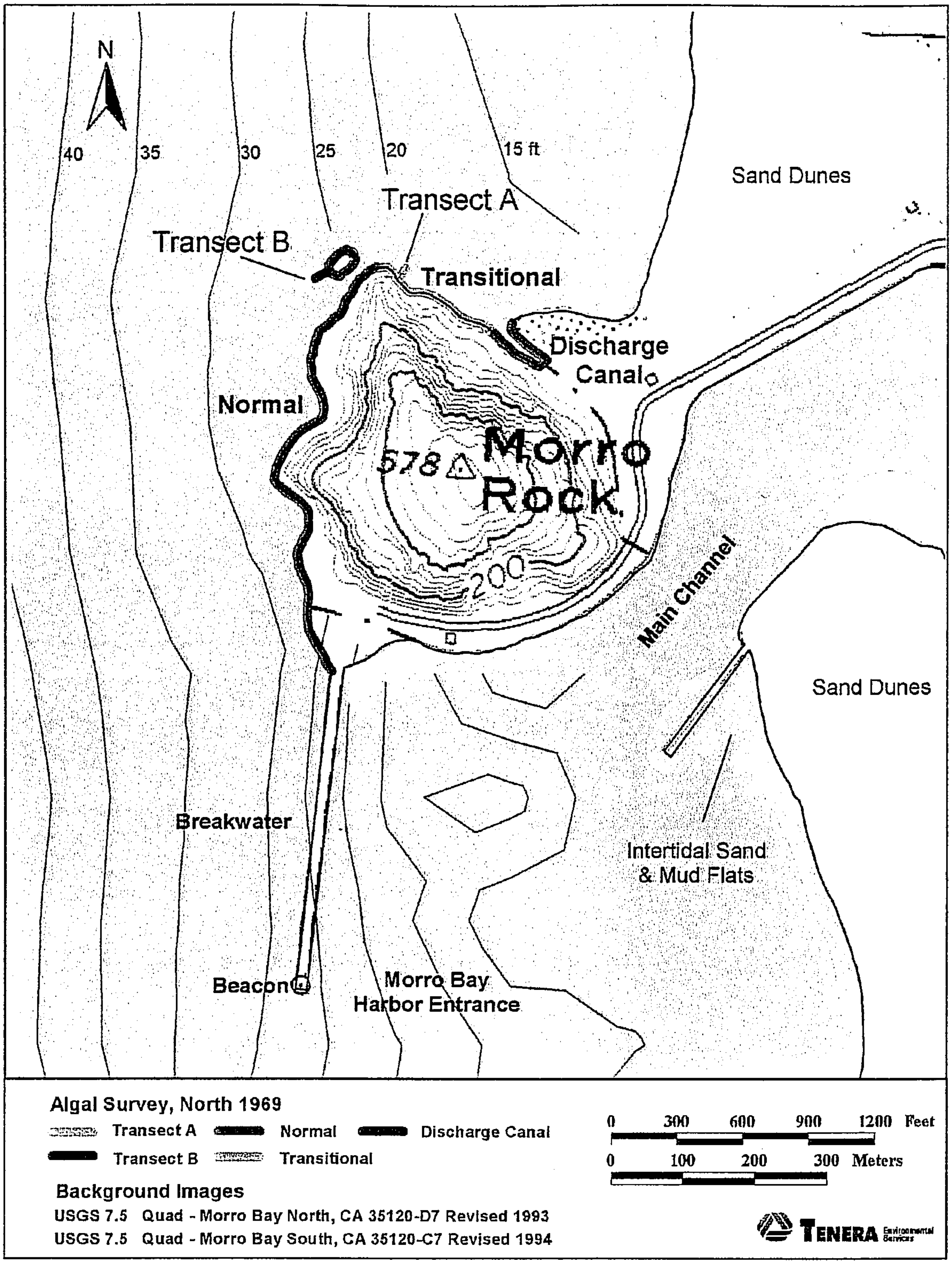


Figure 6.6A-15. Rocky intertidal sampling locations in 1967—68 (North, 1969).

SCUBA inspections of the discharge canal were conducted on three occasions between March 1967 and January 1968. The highest water temperature recorded within the discharge canal was 25.1° C (77° F) on March 1, 1967. Much of the rocky substrate was blanketed with sea anemones Anthopleura elegantissima and Anthopleura xanthogrammica. While North reported only drifting fragments of macroscopic algae in the discharge canal, J. Adams and J. Warrick (PG&E biologists) observed Iridaea (renamed Mazaella) flaccida and Corallina chilensis growing at the canal terminus.

Inspections of the transitional region were conducted on three occasions during the study period. It was difficult to examine the transitional region close to the discharge because of poor underwater visibility and unfavorable surf conditions. Sparsely distributed clumps of *Prionitis lanceolata* were noted in the intertidal zone next to the canal on March 1, 1967. The algal stands within the transition region were characterized as having low density and low species diversity. Additionally, a large proportion of the algal stands that were observed in the region were either grazed heavily or encrusted with fouling organisms. The abundance of algal species increased dramatically (from 7 species to 20) near the border of the normal region. The sessile fauna of the transition region was characterized as impoverished when compared to either the canal area or the normal zone. Low concentrations were common for the 27 animal species reported from the transition region. Fishes, it was noted, may have been the exception. The transition region was cited as being a popular area for fishing and subject to intense fishing pressure.

The normal region supported a community of plants and animals which was considered typical for exposed rocky intertidal areas of the central coast. At about Transect A, the sparse algal community of the transitional region reverted to the diverse algal cover characteristic of the normal region. This transformation occurred within a horizontal distance of approximately 10 m (33 feet). To fully describe the normal state, the entire west side of Morro Rock was surveyed and a species list was compiled. A total of 88 seaweed species and 44 animal species was recorded for this region. Nineteen of the plant species and 38 animal species were observed along Transect B. Five of the 19 seaweed species were not found elsewhere in the normal region.

Data provided to North by PG&E indicated that waters adjacent to the west face of Morro Rock were occasionally exposed to moderately diluted effluent. This effluent had the potential to affect biota within what was defined as the normal region. In order to resolve questions about the original condition of the normal region, a comparative study of the region and a control area was conducted. The control area chosen was Diablo Cove, an area of pristine rocky coast about 15 km (9 miles) south of Morro Bay. Seaweed species from near Morro Rock and Diablo Cove were tabulated according to whether they were warm or cold water forms. North concluded that the influence of intermittent, diluted effluent on species abundance and diversity within the normal region was negligible. The transitional region, however, appeared to be substantially altered.

1999 Resurvey of the Morro Rock Intertidal and Subtidal Community

This study establishes a recent thermal effects account of the intertidal and subtidal benthic marine community of Morro Rock. The surveys were completed in the late morning/early afternoon hours on August 7 and 9, 1999. Sea conditions were exceptionally calm in the transition region, which, on the days of the survey, was protected from swells out of the southwest. The normal region was more exposed to the low southwest swells (heights less than about 1 m). Underwater visibility ranged between 1 to 3 m (3 to 10 feet) in both regions.

Morro Rock is the nearest rocky habitat in the vicinity of the Morro Bay Power Plant discharge that supports benthic marine algae and invertebrates (see Figure 6.6A-16). The subtidal community was previously studied by Dr. W.J. North in 1967 and 1968 (North, 1969) and PG&E, 1971. North's study consisted of tallying the occurrences of algae and invertebrates in a series of swim-overs around Morro Rock and along two permanent vertical transects (see Figure 6.6A-15). Tenera Environmental's study was designed to establish a recent baseline and to compare present conditions to North's 1969 results (North, 1969; PG&E, 1971). We also included a quantitative survey of species abundance along North's vertical subtidal transects and additional transects within North's survey area.

Qualitative Surveys

Lists of species occurrences were developed from reconnaissance dives in North's transition and normal regions (see Figure 6.6A-16). Two divers began at the discharge terminus and swam around Morro Rock to the breakwater making up and down dives to cover a broad range of depths. The area sampled in the transition region extended from the intertidal (about the +1 m MLLW) to the subtidal at the base of the rock terminating on sand flats. The normal region was less completely sampled where slightly rougher sea conditions on the west face of Morro Rock did not permit close inspection of many intertidal and shallow-water zones. Most observations were limited to depths below -2 m (-7 feet) MLLW consistent with North's study. All algal, invertebrate, and fish species that were observed were recorded.

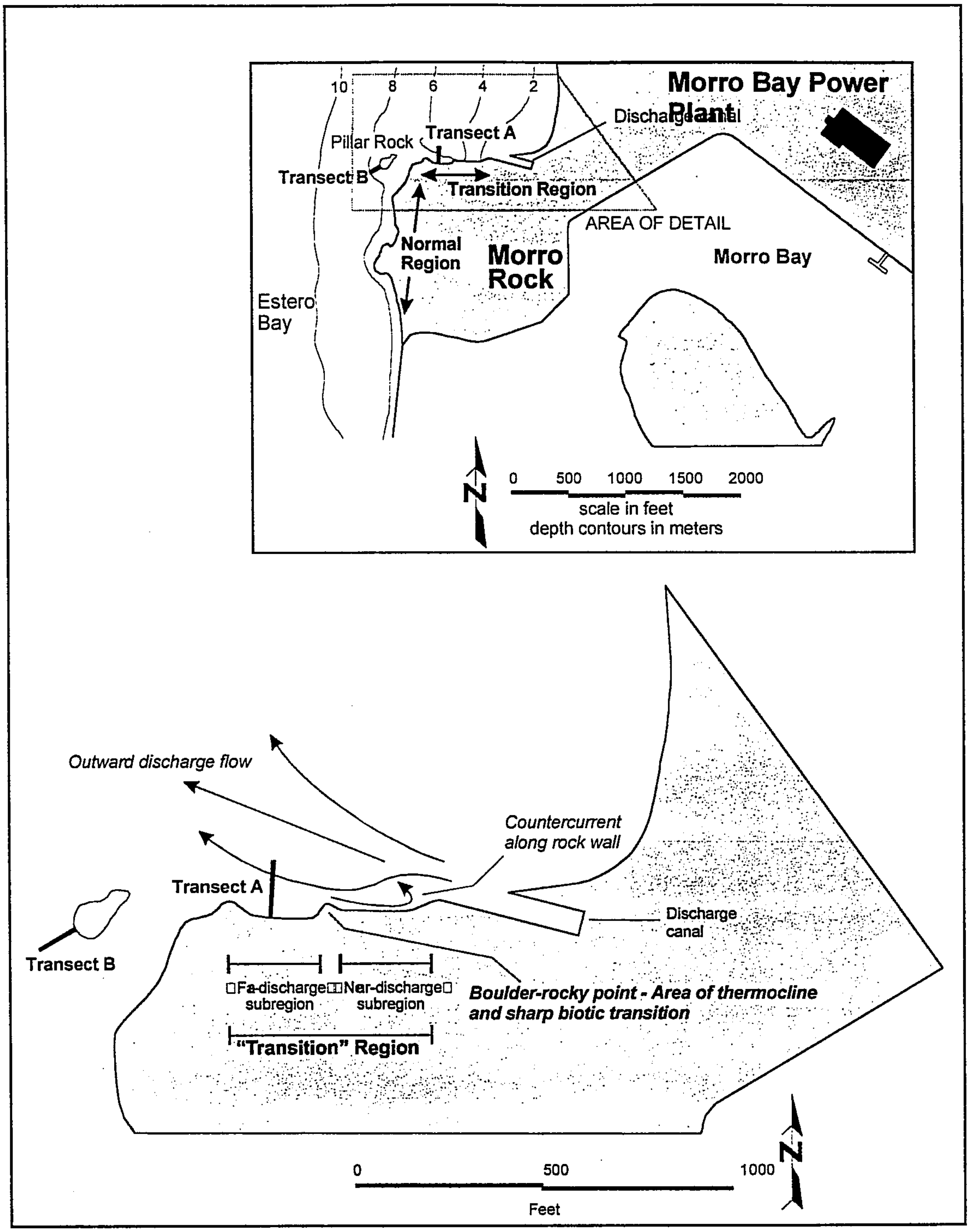


Figure 6.6A-16. Currents, thermocline, and areas of biotic transition observed on August 7 and August 9, 1999.

Note that the thermocline and location of sharp biotic transition occurred at a rocky boulder point along the rock wall. The "transition" region can be partitioned into "near-discharge" and "discharge" subregions based on differences in species composition and abundance.

Quantitative Surveys

Algal and invertebrate cover and densities were recorded along North's two vertical transects (Transects A and B in Figure 6.6A-16). At each transect a meter tape was deployed downward from the MLLW tide level to the rock base (sand flat region). The MLLW level was determined from National Oceanic and Atmospheric Administration (NOAA) predicted tide and time charts and seawater height at the time of sampling. North's Transects A and B were relocated as accurately as possible according to illustrations of locations, transect lengths, slopes, and depths provided in North (1969). Transect A terminated in water shallower than that described in North (1969). Nearby areas were inspected for other possible locations, but it appeared that the sandy sediment bedload at the base of Morro Rock had risen such that the sand flat at Transect A was about 2 m (7 feet) higher than what North previously found. Transect B was less difficult to relocate. Each transect was sampled in one meter intervals in one meter long by 2 m wide segments.

We also completed horizontal transect sampling at the top of each vertical transect to quantify algal and invertebrate abundances in shallow-water zones not sampled by North. Five adjoining 1 m x 2 m quadrants were placed at the top of each vertical transect at the MLLW tide level. The horizontal and vertical transects formed a T-shape (T-transect) sampling area. We also established and sampled a new, third T-transect directly in front of the discharge canal terminus.

Scheduling and Sampling Conditions

Surface water temperatures were noted at several locations using the dive boat electronic temperature recorder. Surface water temperatures during the August 7 survey were about 56 to 59° F (13 to 15° C) in the transition region and about 56° F in the normal region. Surface water temperatures were slightly lower on August 9 in the normal region (about 53° F; 11.7° C). However, higher water temperatures were recorded in the transition region (about 63° F; 17° C). Water temperatures at the discharge terminus were about 67° F (19° C) on August 9. Layers of fine silt covered the benthic algae and invertebrates, particularly in the transition region. Field identifications were made to the lowest taxonomic level possible. Some specimens were collected and identified in the laboratory.

Intertidal

The intertidal zone of Morro Rock is narrow due to the steep faced walls of the rock. Observations of the intertidal zone were made from a boat in combination with diver surveys. Mussels (*Mytilus* spp.) and barnacles (*Balanus* spp.) were conspicuous in both the transition and normal regions. Mussels were so densely compacted that the intertidal zone from a distance appeared as a continuous black band around Morro Rock. Sea stars (*Pisaster ochraceous*) were abundant, feeding on the mussels and barnacles. There was not a sufficient amount of shoreline observations to differentiate the transition from normal region based on intertidal invertebrate distributions.

In contrast, intertidal algal distributions supported North's observation of a normal and a transition region. Intertidal algae that were abundant in the normal region were noticeably less abundant in the transition region. In the normal region, brown kelps (*Alaria marginata* and *Laminaria setchelli*) occurred in dense stands, hanging from the rock walls along with dense clusters of the iridescent seaweed (*Mazzaella flaccida*). Both *M. flaccida* and *L. setchelli*i were present in the transition region, but in lower abundance.

Subtidal

Rocky substrate in the subtidal area along Morro Rock was nearly covered with algae or invertebrates. The transition and normal regions could not be easily differentiated based solely on species richness (numbers of taxa). In contrast to North's study, we found that the numbers of algae and invertebrates in both regions were similar (see Appendix 6.6A-4 for species comparisons between regions). The normal and transition regions could be distinguished from each other on the basis of certain species. Foliose and fleshy red algae and kelp species were more abundant with distance from the discharge. The transition region could be partitioned into two subregions; "near-discharge" and "far-discharge" (see Figure 6.6A-16). The near-discharge subregion was characterized mainly by the tube-building polychaete worm *Phragmatopoma californica* that covered 100 percent of many rocks. The encrusting bryozoan (*Waterispora subtorquata*), carnivorous snails (*Acanthina punctulata*), and aggregating anemones (*Anthopleura elegantissima*) were also most abundant in this subregion. Brown algae were lacking, except for a few individuals of giant kelp (*Macrocystis pyrifera*) that occurred within 50 m of the discharge canal terminus.

The far-discharge transition region was identified by the occurrence of several plants of the brown kelp (*Laminaria setchellii*), feather boa kelp (*Egregia menziesii*), and surfgrass (*Phyllospadix torreyi* and *P. scouleri*). The changes in biota at this location coincided with changes reported in discharge temperatures by Tenera Environmental's divers. The divers reported sensing a temperature change at the mid-point of the transition region where rock outcroppings deflect the plume away from Morro Rock.

The normal region consisted of rocky outcroppings alternating with indented surge pockets. The base of Morro Rock in this region is deeper (about 7 to 10 m; 23 to 33 feet) than the transition region. The rocky outcroppings supported dense stands of *L. setchellii*, foliose red algae, and articulated coralline algae to depths of 5 m (15 feet). Invertebrates, which were not conspicuous in this shallow-water algal zone, appeared as dense mats of tunicates and sponges that covered nearly 100 percent of the rocks beginning -5 m (-15 feet). The sides of the surge pockets were largely barren of algae and invertebrates. At the bottom of the surge pockets were dense aggregations of anemones (*Anthopleura xanthogrammica*), feeding on the mussels and barnacles that had broken loose and fallen as a result of the pounding waves.

Preliminary results from the transect surveys are consistent with broader scale dive observations. Abrupt differences in algal and invertebrate abundances were noted vertically and between transects. At the discharge terminus, total algal cover was less than 29 percent. There, dense mats of *Phragmatopoma californica* covered most of the rocks from MLLW to the bottom. Tufts of filamentous red algae (*Polysiphonia* spp., *Pterosiphonia* spp., among others) coated many *P. californica* tubes below MLLW. Transect A, located about 170 m (560 feet) from the discharge terminus, is colonized by dense stands of red algae (*Cryptopleura violacea*, *Rhodymenia* spp., *Gastroclonium subarticulatum*, among others) that covered nearly 100 percent of the rocks in the MLLW horizontal transect. A few kelp plants of *Laminaria setchellii* also occurred in the horizontal transect. Algal cover quickly diminished in abundance with depth along vertical Transect A.

Transect B, located about 240 m (790 feet) from the discharge terminus, in deeper water, is colonized by a different, yet dense algal assemblage. Foliose algae (e.g. *Mazzaella lilacina*, *Neoptilota hypnoides*, *Gelidium robustum*, *Prionitis lanceolata*, among others) and articulated coralline algae (*Calliarthron cheilosporioides*) are abundant at MLLW to depths of about -5 m, and covered 100 percent of many rocks. *Laminaria setchellii* occurs in dense stands of over a hundred plants per square meter (m^2), along with tunicates and sponges at depths below -5 m (-16 feet). The survey results of 1967/68 and 1999 at Transects A and B are compared in Figure 6.6A-17.

Conclusion

This study establishes a recent account of thermal effects on the intertidal and subtidal benthic marine community of Morro Rock. Surveys were conducted on August 7 and 9, 1999. Additional survey data have been collected in September 2000 and are being analyzed at the present time.

Evidence was found in species composition and abundance indicating that the north face of Morro Rock represents a thermal effects transition area. Areas further away did not appear affected by the thermal plume. Near the discharge however, further natural and temperature-related changes in species composition and abundance may still be expected to occur.

Differences in environmental factors, however, other than temperature may also explain the biological gradients observed around Morro Rock. These include shading effects from Morro Rock itself. Gradients in salinity may also occur in the study area when the power plant discharges brackish water drawn from Morro Bay during outgoing tides, particularly during periods of heavy rain runoff. Gradients in water clarity in the discharge area have also been observed (Tenera Environmental staff, unpublished observations). On some occasions the discharge plume is recognizable because it is more turbid than the ocean receiving water. On other occasions the receiving water is more turbid. During the survey, there were countercurrents of cool water along portions of the transition region where divers felt the movement of cool water towards the discharge canal terminus. Sand scour effects may also create different species assemblages between regions of Morro Rock, as well as wave impact effects.

The large dominant mats of the tube-building polychaete worm (*Phragmatopoma californica*) that were present near the discharge terminus during our study were not present several years ago (Tenera Environmental staff, unpublished observations). The presence and relatively large abundance of tubiculous polychaetes *Phragmatopoma californica* Fewkes in the proximal region of the transition area (near-discharge subregion) may favor by the presence of discharge water temperatures and flow. The colonial worm which is easily identified in its large stands of sand and parchment tubes, is described from its southern California distribution as a warm water species (Abbott & Reish, 1980). However in a study of thermal effects of the Diablo Canyon Power Plant discharge a few miles to the south of MBPP increases in *P. californica* abundance were observed in both ambient and discharge water temperatures (Tenera Inc., 1997). From these studies there is no reason to conclude any connection of the worm's abundance at the MBPP discharge to discharge temperatures.

Ocean current patterns during El Niño periods, such the recent 1996-1997 event are important mechanisms in the northern transport of California species (Barry et al., 1995; McGowan et al., 1998). Once established, *P. californica* colonies form "climax" communities that can occupy the colonized space for years. The weight of *P. californica* gametes and larvae cause them to sink

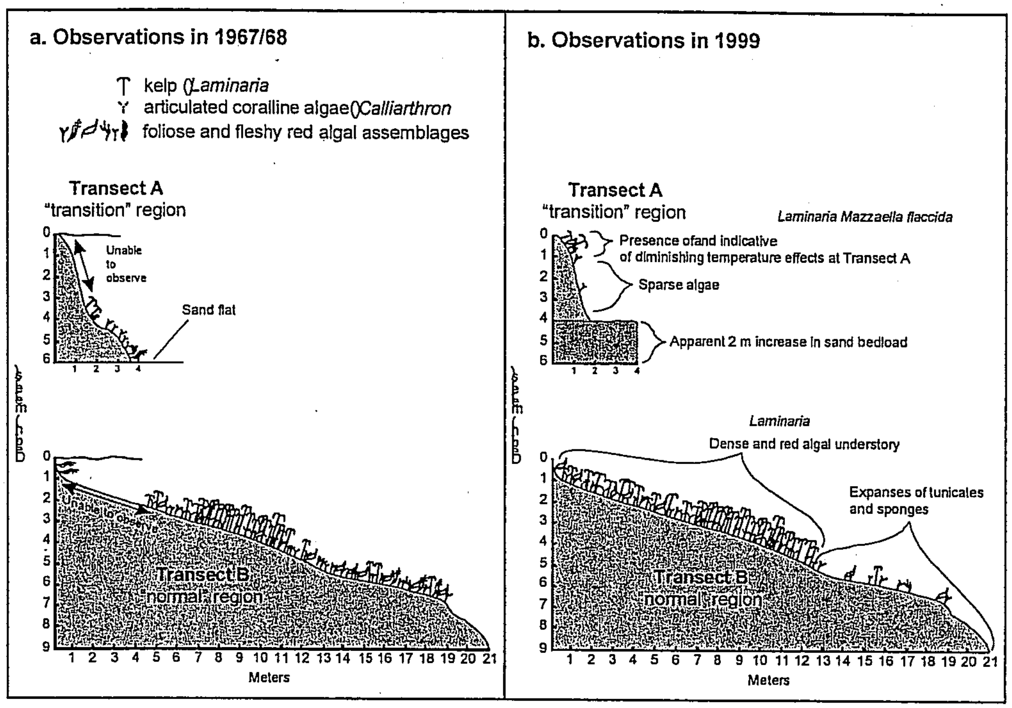


Figure 6.6A-17. Comparisons of algal assemblages in 1967/68 and 1999. Illustration shown in (a) is from Figure 3, North, 1969.

quickly to repopulate their colony (Thomas, 1994). Such a property favors their successful colonization of wave and current swept areas, possibly including current flows associated with power plant discharges.

In addition, giant kelp (*Macrocystis pyrifera*) was common in our study, but was not present during North's surveys. The receiving water benthic marine community on Morro Rock will also continue to exhibit some amount of additional change over time, particularly in the transition region. The spatial extent of change will be related in part to how discharge characteristics may vary from plant operation.

Available Algal Thermal Tolerance Data

Studies on the thermal tolerances of algae found along the central coast of California are relatively rare in the scientific literature. Therefore, laboratory studies on the expected effects of the warm water discharge on common and abundant algae were conducted to provide information to the RWQCB during the permitting of the Diablo Canyon Power Plant. These studies were done at a facility operated by PG&E at the power plant site. They provide us with thermal tolerance information on algal species that are also present in the areas contacted by the thermal discharge from the MBPP. The results of these studies are summarized in the Table 6.6A-17.

Although large beds of the bull kelp, *Nereocystis leutkeana*, are not present in the area around Morro Rock due to the lack of rocky substrate, isolated plants do occur. This species had the lowest thermal tolerance (18° C; 64.4° F) of any of the algae tested at Diablo Canyon. The thermal tolerances for two sub-canopy kelp species, *Pterygophora californica* and *Laminaria setchellii*, that are abundant in the area around Morro Rock were determined to be slightly higher at 19 and 20° C (66.2 and 68° F), respectively. The foliose red alga, *Crytopleura ruprechitiana*, that also occurs subtidally around Morro Rock, showed negative effects of temperatures ranging from 19 to 21° C (66.2 to 69.8° F).

The results of subtidal field studies at Diablo Canyon during plant operation supported the laboratory results. Impacts to all of these species were observed in the shallow subtidal areas of Diablo Cove most affected by the discharge. The areas of the cove that were deeper than 8 to 10 m (26 to 33 feet) were less frequently contacted by the thermal plume and the effects on the species found there were reduced in magnitude, except for bull kelp. Bull kelp is an annual that repopulates the cove each year, rapidly increasing in size as it grows towards the surface where contact with the thermal plume causes deterioration during late summer.

The only intertidal algal species tested that showed some potential for impacts was the red iridescent seaweed, *Mazaella flaccida*. Laboratory studies showed complete mortality in adult plants after a 60-day exposure to 22° C (71.6° F). Although only portions of the intertidal population of this alga in Diablo Cove were predicted to be affected, the operation of the power plant resulted in the loss of almost the entire population from the cove. The loss of this major habitat forming alga set in motion secondary changes throughout the intertidal community. The resulting effects, which were greater than predicted, provide an example of the level of uncertainty in which system-level predictions.

TABLE 6.6A-17

RESULTS OF LABORATORY THERMAL TOLERANCE TESTS FROM STUDIES CONDUCTED AT THE DIABLO CANYON POWER PLANT

TAXA	LIFE STAGE TESTED	THERMAL TOLERANCE	OTHER COMMENTS
Subtidal			
Nereocystis leutkeana	juvenile sporophyte	18° C	44 day exposure
Pterygophora californica	adult sporophyte	19.1° C	96 hour exposure
Laminaria setchellii	gametophyte	20.1° C	Germination of zoospores affected at temperatures > 18° C
Mazzaella cordata	gametophyte	22.7° C	Based on early development and growth of gametophytes after 15 days
Crytopleura ruprechtiana	adult sporophyte	19-21° C	96-hr exposure
Intertidal			
Mazzaella flaccida	sporophyte	22° C	Cultured and field collected sporophytes showed similar tolerance after 60 days
Gastroclonium subarticulatum	adult	23.8° C	Only limited effects after 216 hr exposure
Calliarthron tuberculosum	adult	23.8° C	Some bleaching occurred at 21° C after 216 hours. Experiment extended past 96 hr due to absence of any effects.
Phyllospadix spp.	adult	>24° C	Tolerated 24° C treatment for 216 hours. Experiment extended past 96 hour due to absence of any effects.

Source: Tenera, 1997

Kelp Habitat

The thermal discharge of the MBPP may affect individual kelp plants growing in the immediate vicinity of the discharge near the north side of Morro Rock. However, it will not affect kelp beds; none are located within the influence of the plume.

Open Water Habitat

The surface orientation and the smaller size of the Project's thermal plume will not affect the species living in Estero Bay's open water habitat. The phytoplankton and zooplankton will not be affected by the Project's thermal plume based on thermal tolerance information summarized below. Results from thermal effects studies of the fishes in the open water habitat showed that they will not be affected by the Project's thermal plume. Many fish species captured during these studies appeared to be tolerant of a wide range of temperatures due to their abundance in both ambient water temperatures and the elevated water temperatures within the thermal discharge. Others appeared to be attracted to the warm water based to their relative abundance within the thermal discharge. These studies are summarized below.

Phytoplankton

Phytoplankton will encounter the thermal plume of the modernized plant's shoreline discharge as it rises to the surface, but its temperatures will not harm the Morro and Estero bays' nearshore phytoplankton. Phytoplankton, unicellular floating algae, provide the base of the ocean's food chains. A number of studies have demonstrated their high degree of thermal tolerance. This thermal tolerance combined with the short generation times of many algal species (Fogg, 1965) increases their ability to compensate rapidly for any localized changes.

Phytoplankton studies at other estuarine and marine power plant sites found:

- During cooler months, the photosynthetic rates of entrained phytoplankton may increase, but no changes in the species composition or overall abundance of algal populations so affected would be expected (Brooks et al., 1974; Jensen and Martin, 1974; Smith et al., 1974; Hamilton et al., 1970; Heffner et al., 1971);
- During warmer months, the photosynthetic rates of entrained phytoplankton may decrease temporarily without altering the photosynthetic capacity of the receiving waterbody phytoplankton populations (Brooks et al., 1974; Jensen and Martin, 1974; Smith et al., 1974; Hamilton et al., 1970; Heffner et al., 1971);
- Discharge temperatures in excess of 32° C (90° F) are generally required before reductions in the photosynthetic capacity of entrained phytoplankton populations occur (Hamilton et al., 1970; Brooks et al., 1974). Some studies indicate that the crucial discharge temperature may be closer to 38° C (100° F) (Heffner et al., 1971; New York University, 1975). Patrick (1969) reported lethal temperatures for most algal species studied ranging from 33.1 to 45° C (91.5 to 113° F), with the majority near 43.9° C (111° F).

The thermal discharge of the modernized plant will not exceed the reported temperature tolerances of phytoplankton. Therefore, the modernized plant's discharge will not have any significant adverse impact on the Estero Bay's phytoplankton community.

Zooplankton

Zooplankton will encounter the thermal plume of the modernized plant's shoreline discharge as it rises to the surface, but its temperatures will not harm Morro and Estero Bays' nearshore and slough zooplankton. Zooplankton, organisms typically microscopic in size, are found in dense concentrations drifting in Estero Bay's ocean currents. They feed on unicellular algae, detritus, bacteria, and other zooplankton. Their rapid growth and reproduction provides the transfer of phytoplankton primary production energy to higher trophic levels such as larval fishes. Studies of zooplankton thermal tolerance suggest that, in general, temperatures in excess of 30° C (86° F) are required to cause significant mortality. Lauer et al. (1974) reported that *Acartia tonsa*, an abundant copepod in Morro and Estero bays, may tolerate 15-minute exposures to temperatures as high as 33.5° C (92.3° F). The reported thermal tolerance limit of *Acartia tonsa* and *Eurytemora affinis* are 35 and 30° C (95 and 86° F), respectively (EPA, 1971). *Calanus finmarchius* has been shown to have a thermal tolerance limit of between 26 to 29° C (78.8 to 84.2° F) (EPA, 1971). The thermal tolerance temperature of these zooplankton species is above any predicted discharge plume temperature for the modernized plant's discharge.

1971-1972 Studies of the Thermal Effects on Fishes

A fish population study conducted in 1971-72 (PG&E, 1973) was conducted within Estero Bay to address questions about the effects of the thermal discharge on fish communities and their distributions. Four sampling locations within Estero Bay were selected for study. The locations were designated F-1 through F-4, as shown in Figure 6.6A-18. Station F-1, influenced by the thermal plume, was 3 to 4° F above ambient water temperature. Station F-2, at the center of the discharge, had delta T temperatures of approximately 20° F above ambient water temperature. Stations F-3 and F-4 were not in the thermal plume and served as controls.

Collection and Processing Methods

Three capture methods were used in order to sample fish species occurring throughout the water column. Otter trawls were used to sample demersal fishes and two variations of set gill nets (floating and sinking) were used to sample fish within the water column. Time and water

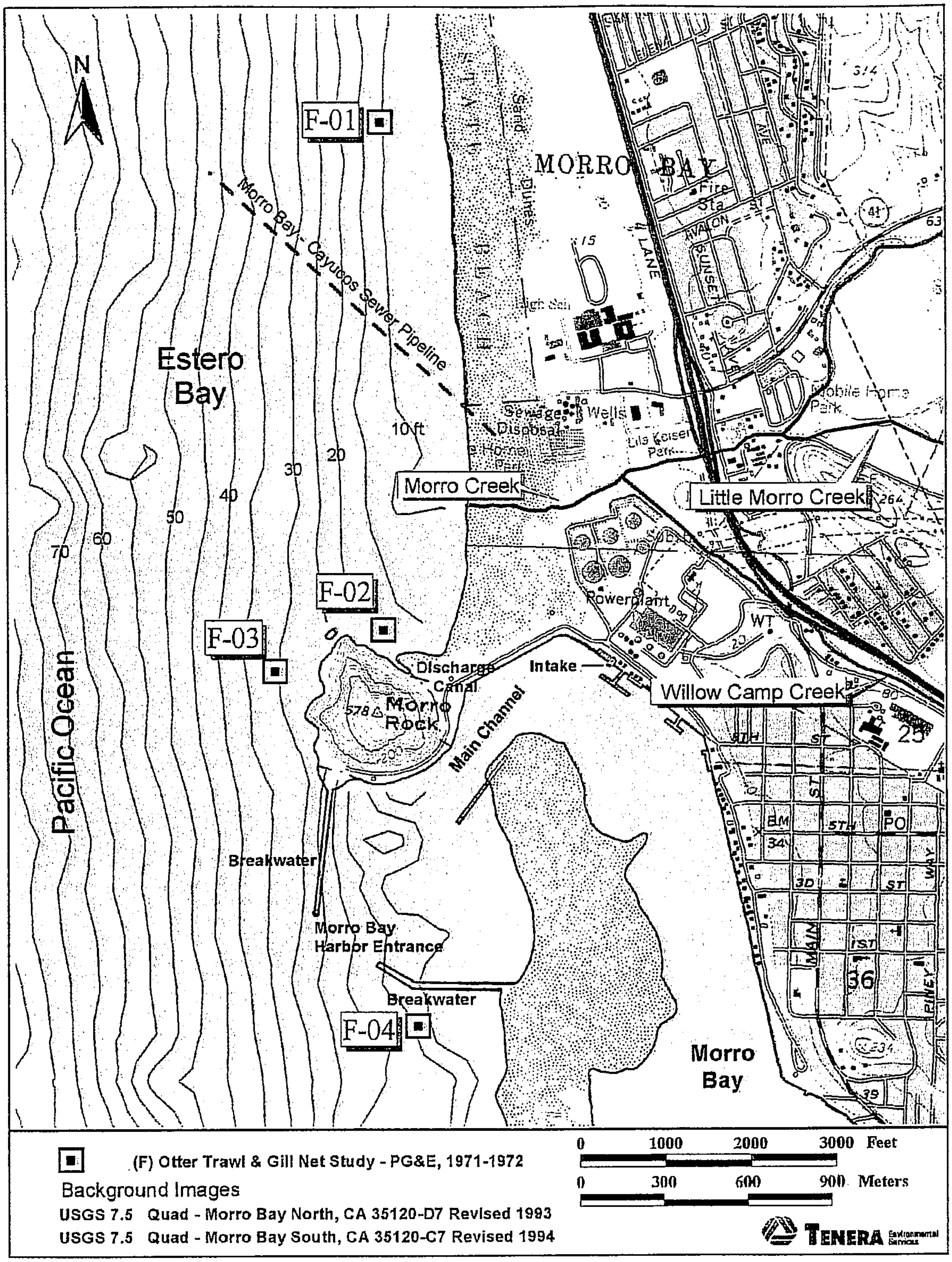


Figure 6.6A-18. Otter trawl and gill net sampling locations in 1971—72 (PG&E, 1973).

temperature profiles were recorded at each station following gill net deployment. Fishes, invertebrates, and detritus were removed following each collection. Fishes were separated by species, and their total lengths were recorded. The combined weight of all individuals within a species was recorded.

The weights and lengths of fishes captured during a sampling effort were averaged for analysis. Data were analyzed using two-way analysis of variance. The underlying assumptions for this statistical method were accepted (normality and equal variance), although the paucity of replications made these assumptions unverifiable. Data were analyzed to determine simultaneous differences between sampling stations (indicating possible thermal discharge effects) for all stations, gear types, and for each fish catch parameter. Differences between gear types for each station and fish catch parameter were also analyzed. The hypothesis that all sample means were equal was tested against an alternate hypothesis that all sample means were not equal.

Results

During the fish population study, a total of 553 fishes, representing 32 different taxa, was collected. Twenty-two percent of all fishes captured during the study (7.7 fish caught per unit effort) were caught in what was categorized as ambient temperature water. Transitional temperature ranges (delta-T of 3.0 to 3.7° F [1.7 to 2.1° C] above ambient) accounted for 8.9 percent of the total catch (9.8 fish caught per effort), and 69.5 percent of all fishes captured during the study (28.2 fish caught per unit effort) were taken from discharge temperatures (delta T of 12.0 to 12.1° F [16.6° C] above ambient). Of the 32 taxa collected during the study, 67 percent were taken from discharge waters. The same percentage of the species total (67 percent) was collected from ambient temperature water, however, only 38.3 percent of these were the same as the discharge species. Species captured in transitional water temperatures accounted for 29.5 percent of the total, 14.7 percent of which also occurred in the discharge temperature range. The species captured in both ambient and discharge temperature ranges (38.3 percent) were categorized as eurythermal (tolerant of a wide range of temperatures). Because of the number of individuals of these species captured in discharge temperature ranges, it was suggested that they might also be thermophilic (preferring warmer temperatures).

The results of the linear regression and correlation tests indicated a correlation, although not significant, in the third sampling period between temperature, number of species, and the diversity index for the sinking gill net gear. The nonlinear trend suggested that more species occur as water temperature increases. This seemed particularly evident at the discharge with a delta-T of 20° F (11.1° C). All catch methods had data which correlated with temperature when the entire year's sampling effort was considered, however, more data were required to properly evaluate the fishing methods used in this study.

Summary

Classification of species with an apparent temperature preference was performed by comparison of common species from concurrent studies at five San Francisco Bay Area/Sacramento-San Joaquin Delta power plants as well as PG&E's Humboldt Bay, Moss Landing, and Morro Bay power plants. The temperature affinity classification of fish species was based on their abundance in any one temperature zone at each power plant. Potential temperature affinities were classified according to species, temperature zone, and by power plant. Temperature affinity classifications for each species for all power plants studied were pooled for final classification. Only two species which could be categorized (using the study's criteria) as having a temperature affinity were English sole *Parophrys vetulus*, which showed preference for ambient temperatures, and topsmelt, which showed an affinity for discharge temperatures. Because of the abundance of individuals as well as diversity of species within discharge temperature zones, it was suggested that factors other than temperature, (including geographic, physical, and biotic factors/differences between power plants) might have influenced fish distributions. Seemingly, the geography of the power plant, associated substrates, and other physical factors could influence the distribution of fish, which may or may not coincide with the specified temperature zones in this study. Biotic factors including food supply and abundance of predators could also influence distribution.

Many fish species captured during this study appeared to be eurythermal due to their abundance in both ambient water temperatures and the elevated water temperatures within the thermal discharge. Others appeared to be thermophilic due to their relative abundance within the thermal discharge. Otter trawl gear and sinking gill nets were the sampling methods that yielded the highest index of diversity, indicating a fish community associated with the bottom and mid-water areas of the water column.

1974 Angler Use and Catch Composition

Information was gathered from the MBPP during a four-month creel census program in 1974 at six PG&E thermal power plants (Steitz, 1975). The program was undertaken to supplement the thermal studies program with additional biological descriptions of thermal impact areas, and to provide some specific information regarding sport fishing at MBPP.

The sampling program was established to provide such information as angler success and catch composition at individual power plants, as well as to examine any direct relationships between weather, tidal influence, and plant generating load upon the above mentioned parameters.

Creel census at the MBPP was conducted from July 9 through October 28, 1974. The 4-month sampling period was stratified into two successive 2-month sampling periods. Sampling dates were randomly selected with the restriction that each day of the week was to be sampled at least once at during the sampling period.

Methods

The shoreline near adjacent to the thermal discharge was divided into survey zones as shown in Figure 6.6A-19. Survey zones were established at the power plant for the purpose of delineating the influence of the thermal plume as related to its configuration at various tidal stages, and analyzing this influence with respect to angler success, catch composition, and possible angler use patterns.

All sampling was conducted within a legal California fishing day, beginning 1/2 hour before sunrise, and ending 1/2 hour after sunset. Bi-hourly use counts were used to provide estimates of fishing pressure as well as to supply additional information regarding specific recreational uses at areas adjacent to the power plant.

Only shore anglers were interviewed during the sampling period. The following information was recorded: number of anglers in the party, total time fished (to the nearest half-hour), total fish species caught, number of fishes kept and released by the fish species, zip code, and time of interview. At the time of the interview, the census taker also recorded the following information: air temperature, wind velocity and direction, a general rating for the weather (subjective scale), and the plant zone in which the interview took place. The tidal stage and generating load were also recorded.

Results

For the total survey period, the combined expanded angler use for all zones surveyed was estimated at 11,826 angler hours. Of the total angler hours spent, shore anglers accounted for 11,001 hours (93 percent) while boat anglers accounted for 825 angler hours. Fishing pressure was only slightly higher on weekends and holidays than it was for weekdays (Steitz, 1975).

Shore anglers were primarily concentrated in the vicinity of the discharge. Zones 1 through 3, most influenced by the thermal discharge, comprised 44.5 percent of the of the total angler use. The average catch per angler hour during the census period ranged from 1.1 fish in Zone 1 to 2.3 fish in Zone 3. The overall catch per angler hour was 1.7 fish. No fishing activity was observed in Zones 4, 5, and 11 during any of the censusing days (Steitz, 1975).

Census takers observed 20 species of fish caught during the 26 days of sampling. Three taxa accounted for 82 percent of the total catch. Jack mackerel was the most numerous species caught, and comprised approximately 53 percent of the total catch. Unidentified sculpins and jacksmelt accounted for 17.0 and 12.1 percent of the total catch, respectively. The combined catch for jack mackerel, jacksmelt, and sculpins accounted for 88 percent of the total catch in Zone 1 (closest to the discharge), 86 percent in Zone 2, and 74 percent in Zone 3. The observed distribution of total angling activity and fish catch between the different geographical zones indicated that there were higher concentrations of fish near the terminus of the discharge canal than at points distant from it along the shoreline (Steitz, 1975).

Correlation analysis examined the extent of the relationship between catch per angler per hour of each species and of all species combined (both total caught and total kept) for each zone and various independent variables. The correlation analysis found that there was a significant correlation between catch and tide elevation, tide direction, plant generation load, and time of day. Based on overall catches (and also for the most abundant species-jack mackerel), higher plant load and associated discharge temperatures were associated with increased catches. The highest rate of catch was from Zone 2 (Steitz, 1975).

Thermal Tolerances of Fishes

Topsmelt *Atherinops affinis*

Surface plume temperatures from the modernized plant's shoreline discharge will not negatively affect topsmelt. Several studies of the thermal resistance of the topsmelt have been reported. Hubbs (1965) found that the maximum upper temperature tolerance for normal egg development is

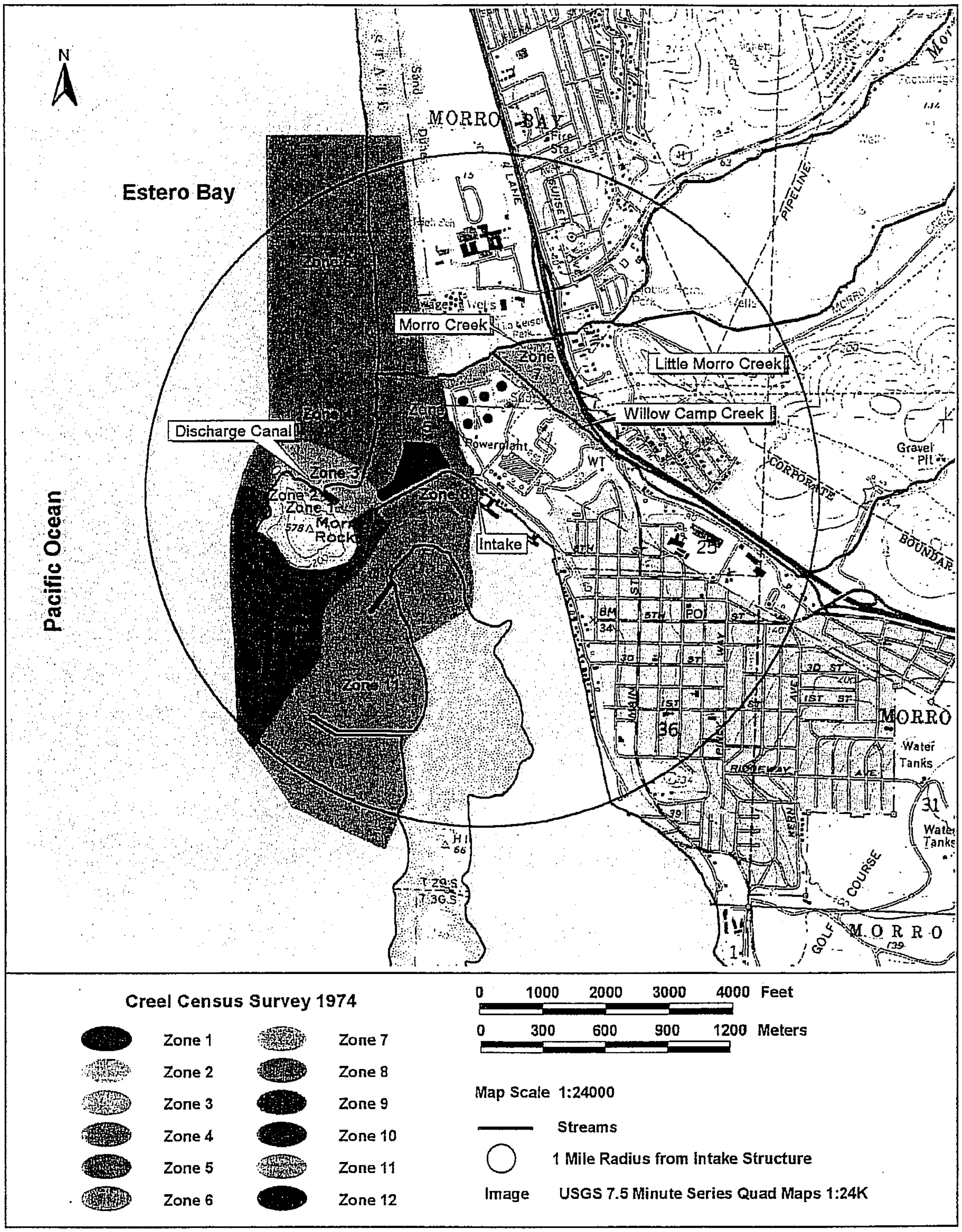
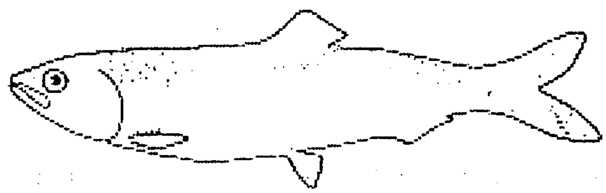


Figure 6.6A-19. Survey zone locations for angler use and catch composition study (Steitz, 1975).

between 27 and 28.5° C (81 and 83.3° F). Eggs exposed to a temperature of 28.5° C (83.3° F) expired shortly after circulatory system development. Carpelan (1955) notes the wide range of natural temperature tolerance of topsmelt (25 to 26.4° C; 77 to 79.5° F) and the species' remarkable tolerance of high temperatures (up to 33° C; 91.4° F). Doudoroff (1945) reported similar findings of the species' high temperature tolerances on specimens which he had acclimated for a period of three days at 20° C (68° F). *A. affinis* tolerated temperatures ranging from 10.4 to 31.7° C (50.7 to 89.1° F).

Pacific Herring *Clupea pallasi*



Surface plume temperatures from the modernized plant's shoreline discharge will not affect Pacific herring. A temperature tolerance range (20.8 to 24.7° C, 69.4 to 76.5° F) is reported for egg survival of the Pacific herring (EPA, 1971). Blaxter (1960) studied the effects of extreme temperatures on the larvae of Atlantic herring. The lethal temperature was determined graphically by plotting pliant dead at a given temperature against time. He found that the upper lethal temperatures for larvae acclimatized to 7.5 to 15° C (45.5 to 59° F) were 22 to 24° C (71.6 to 75.2° F).

Black Surfperch *Embiotoca jacksoni*

The water temperatures recorded in MBPP thermal plume surveys would not affect the survival of juvenile or adult black surfperch in Estero Bay. The expected nearshore temperatures of the modernized plant's discharge plume are less than the laboratory thermal tolerance of black surfperch.

LABORATORY THERMAL TOLERANCE STUDIES CONDUCTED AT THE DIABLO CANYON POWER PLANT.

Lifestage	Acclimation Temperature (°c)	96 hr-LT_{50} (°c)	Critical Thermal Maximum (°c)
Juvenile	12.2	24.5	-
Juvenile	16.0	25.6	-
Adult	16.0	-	28.8

Source:Tenera Inc., 1997

Shiner Perch *Cymatogaster aggregata*

The water temperatures recorded in MBPP thermal plume surveys would not affect the activity of juvenile or adult shiner perch in Estero Bay.

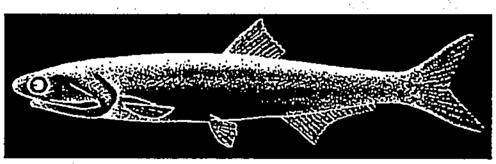
Shiner perch found in the area of the modernized plant's discharge would be attracted to discharge temperatures. Wicke (1968) found that warm summer temperatures followed by cool winter temperatures are necessary for proper embryo development. Ehrlich (communication dated September 7, 1977 from C. Ehrlich, Lockheed Center for Marine Research, Avila Beach, California) found in a series of behavioral experiments that 22.8° C (73° F) is the preferred temperature of juvenile shiner perch and 20.1° C (68.2° F) the preferred temperature of adults.

Pacific staghorn sculpin *Leptocottus armatus*

The water temperatures recorded in MBPP thermal plume surveys would not affect the survival of juvenile or adult Pacific staghorn sculpin in Estero Bay.

Morris (1961) in preliminary tolerance tests of the species found that 25° C (77° F) represented the highest temperature at which immature forms could be held without injury. In his studies of five Oregon cottid species, Pacific staghorn sculpin *Leptocottus armatus* exhibited the greatest degree of seasonal change in metabolic rate. Morris found that the rate of respiration in *L. armatus* is highest in winter and the species' Q_{10} lowest in summer. His findings suggest that the temperature resistance of *L. armatus* is higher in the summer than the winter. Altman and Dittmar (1966) reported that 29.5° C (85.1° F) represented the upper tolerance limit for the adult Pacific staghorn sculpin.

Northern Anchovy *Engraulis mordax*



Adult northern anchovy, swimming in the areas of the modernized plant's shoreline discharge, would not be affected by plume's temperatures. Thermal tolerance data for northern anchovy indicate that hatching and larval development are normal at temperatures below 27° C (81° F), although most spawning occurs at temperatures between 13 and 18° C (55 and 64° F) (Brewer, 1976). The water temperatures recorded in MBPP thermal plume surveys would not limit spawning activity or the survival of northern anchovy eggs and larvae in Estero Bay.

6.6A.2.2 Area-Related Marine Studies

These supplementary sources include studies by CDFG, the City of Morro Bay/Cayucos Offshore Monitoring and Reporting System, Standard Oil Company of Southern California, and research papers from members of the academic community.

6.6A.2.2.1 The City of Morro Bay/Cayucos Sanitary District Monitoring and Reporting Study

The City of Morro Bay/Cayucos Sanitary District, under provisions of an NPDES Permit, is required to conduct benthic surveys on the receiving waters of Estero Bay. This Monitoring and Reporting Program has been conducted semiannually (spring and fall) since 1985 to evaluate the effects of their discharge. Sediment samples are collected for chemical, physical, and benthic infaunal analysis. Regular monitoring of five benthic stations allows for any degradation of the infaunal community to be noted. Summaries of these studies conducted from 1995 through 1998 are presented in Appendix 6.6A-9.

6.6A.2.2.2 Standard Oil of California Potential Oil Spill Study

Standard Oil of California (SOCAL) conducted a study during July-August 1973 and February 1974 to collect ecological information on the sandy and rocky intertidal area of Estero Bay and the entrance to Morro Bay (URS, 1973). The objective of the study was to provide baseline information on the biotic communities that could be affected by an oil spill. Summaries of these studies are attached as Appendix 6.6A-10.

6.6A.2.2.3 Additional Information

A varied assemblage of commercial fishing boats delivers their product to the Port of Morro Bay. Many of the fisheries exploited by local boats are seasonal while others are fished throughout the year. Salmon and albacore trolling are seasonal fisheries, as is the drift gill net fishery for swordfish. Groundfish, including the *Sebastes* spp. (rockfishes) and DTS (dover sole, thornyheads, and sablefish) complexes, are landed throughout the year. Spot prawn, pink shrimp, and halibut trawlers land their product in Morro Bay, as do boats fishing for halibut with gill nets. Information regarding landings from the Port of Morro Bay from 1988 through 1998 are discussed in Appendix 6.6A-11.

The CDFG maintains a database of all commercial landings in the state. The size of each CDFG fishing block is 10 minutes of latitude by 10 minutes of longitude. Block information (fishing location) is required by CDFG to appear on each landing receipt. Port landing data, however, are generally considered a better measure of local fishing and success than block data because of inconsistencies in catch block reporting. A record of landings is useful in determining the importance of each fishery within the area. Dollar values of landings are subject to yearly variation due to the abundance of the target species and its market price. CDFG compiles landing statistics in order to assess the fishery resources of the state. Unpublished commercial and sport catch data from 1975 to 1995 have been obtained for statistical catch blocks in the vicinity of Estero Bay. Total annual commercial landings for Morro Bay from 1993 to 1998 have been gathered and organized for future analysis and assessment as needed.

A similar pattern of seasonal and year round catches occurs with sport fishing in the area. The most fundamental division of sport fishing effort in the area would be anglers fishing from shore versus anglers fishing from boats. Several local surveys have been conducted targeting the fishing efforts and success made from each group. Studies include creel surveys by PSMFC and CDFG. Both agencies are conducting ongoing studies of local party boat fleet catches.

Shorebird Survey of Morro Strand State Beach

Morro Strand State Beach, to the north of the MBPP thermal discharge, is one of the sites that is currently being surveyed as part of an assessment of shorebird populations on regional beaches and the factors that affect their distribution. The study is funded by a grant from the Minerals Management Service (MMS) in an effort to assess the shorebird resource at potential risk from activities associated with the development of offshore petroleum resources. The 3-year study is being conducted by Dr. Jenifer Dugan of the Marine Science Institute, University of California at Santa Barbara (UCSB). Sampling began in November 1998 and will extend through October 2001. Sampling includes a monthly census of shorebirds on 20 beaches in San Luis Obispo and Santa Barbara counties. Measurements of a variety of physical beach parameters are conducted at each site to characterize beach type and assess temporal changes. Semiannual survey of prey species availability are conducted to gather information about factors affecting the distribution of shorebirds and which beaches form the most important habitat.

6.6A.2.3 Pelagic Seabirds

The large numbers of pelagic seabirds found Morro Bay and Estero Bay are not at risk to operations of the MBPP cooling water system intake or discharge. As an important location for migratory birds along the Pacific Flyway, the bays provide foraging and resting areas as the birds fly from their northern breeding grounds to the wintering grounds. Migration into Morro Bay peaks in mid-February. The vast majority of the birds seek out the quiet habitat of Morro Bay, particularly the food-rich shallow mudflats and eelgrass beds. These areas found in the middle and deep interior areas of the Morro Bay provide supplies of eelgrass and sea lettuce for the black brandt *Branta bernicla*, the most numerous of the bay's visitors. Other species such as the common tern *Sterna hirunda*, least-storm petral *Halocyptena microsoma* and the phalaropes (*Phalaropus fulicarius, Steganopus tricolor, Lobipes lobatus*) use the shallow and calm areas to feed and rest, particularly during heavy winter seas. While still other species use of the sand spit for resting which offers refuge from human disturbance and broad shoals during low tide.

The location and design of the MBPP intake minimizes any potential impacts to Morro Bay's visiting or resident pelagic bird species. The intake is located along the shoreline, area of relatively deep water (approximately 20 feet; 6 m), within an area of no particularly useful habitat to the birds. It is also the area in the bay with the highest level of human activity associated with the downtown area's traffic and harbor operations. It is not area that would be attractive to birds seeking forage or refuge. In addition, the intake structures are constructed with a solid inverted weir in the form of a concrete overhang that extends from the front edge of the intake deck to approximately 6 feet below mean sea level (see Figure 6.6A-3). This weir which is designed to prevent floating objects from entering the intake facility's forebay also prevents seabirds from swimming or floating in the area of the intake and accidentally becoming involved in the intake operations.

There is no reason to expect that the MBPPs discharge into the shallow surf zone of Estero Bay could have any impact on the area's pelagic seabirds, particularly since the majority of the birds are found in Morro Bay well beyond any contact with the discharge. Seabirds utilizing the discharge area would be no more disturbed by the presence of the discharge than the relatively high level of human presence related to surfing and fishing activities at the location. Schools of fishes attracted to the flow or temperature of the discharge might in turn serve as prey to diving birds such as terns or pelicans.

6.6A.2.4 Sensitive and Fully Protected Species

Three marine species listed by the CDFG as endangered or Species of Special Concern are reported to occur in the area. These include the southern sea otter, the steelhead rainbow trout, and the tidewater goby. The tidewater goby is currently being considered by the USFWS for delisting in areas north of Orange County.

6.6A.2.4.1 Steelhead Rainbow Trout

Steelhead rainbow trout (*Oncorhynchus mykiss*) are extinct or at low levels throughout the west coast because of a combination of human activities and poor natural conditions. Habitat degradation, hatchery production, and over-harvest have reduced the fish's ability to cope with variable environmental conditions (Capelli, 1998).

No MBPP operating impacts on steelhead rainbow trout (steelhead) result from the existing MBPP intake and discharge nor are any potential impacts expected as a result of the reductions in intake or discharge volumes of the modernized facility. They have not been collected in impingement samples from the recently completed 12-month 1999-2000 impingement study. Steelhead migrate during the spring and summer months from the open ocean through Morro Bay into both Chorro and Los Osos creeks. Steelhead were observed on June 16, 2000 during a survey of Morro Creek (Section 6.6B). Juvenile steelhead usually migrate to sea in the spring when they are from 6 to 8 inches in length, but steelhead enter the ocean year round throughout their range. Larval steelhead are not found in the vicinity of the intake and therefore would not be susceptible to entrainment.

Steelhead migrations routes take both adult and juvenile steelhead through the general areas of the MBPP discharge in Estero Bay and the intake in Morro Bay. However, spawning and rearing activities occur in freshwater habitat well beyond any possible influence of the MBPP. Steelhead are strong and powerful swimmers that could not be affected by the modernized facility's approach velocities of 0.3 fps. Until water velocities reach 10 to 13 fps, the swimming ability of adult steelhead is not hampered (CDFG, 1998). Returning adults are able to easily resist intake velocities as would outmigrating yearlings as they ride tidal currents in excess 6 fps past the MBPP intakes.

Steelhead migrating past the MBPP discharge into Estero Bay might be attracted to discharge flows, in the same manner as they might investigate coastal stream flows. However, the steelhead could move at will in or out of MBPP discharge flows and also could avoid the surface plume. Although discharge thermal plumes have been observed in the past to occasionally extend as far north as the entrance to Morro Creek, the plume is only inches thick at this great distance from the point of discharge. The plumes' shoreward margins disappear in the surf zone based on information gathered from infrared (IR) aerial images of this area. Steelhead have difficulty extracting oxygen from freshwater at temperatures greater than 70° F (Hooper, 1973), but discharge plume temperatures would not be expected to exceed a degree or two above ambient in this region. Plume temperatures of even this small amount would be even less likely given reduced volumes of the modernized MBPP discharge. Steelhead can avoid discharge plume temperatures by finding ambient water temperature immediately beneath the surface discharge plume.

6.6A.2.4.2 Tidewater Goby

Tidewater gobies (*Eucyclogobius newberryi*), have been found in Morro Bay's brackish marsh habitats at the mouths of Chorro and Los Osos creeks (Horn, 1980). Larvae that were tentatively identified as tidewater goby were collected in front of the MBPP cooling water intakes and at several Morro Bay source water stations during the 1999-2000 entrainment study. The identifications were verified by taxonomic experts in early August 1999. However, recently completed DNA analysis, performed on nearly 10 percent of the specimens, refute the identifications. None of the specimens are tidewater goby based on the DNA test results. Eighty-five percent of the specimens were genetically identified as shadow goby *Quietula y-cauda*. The DNA from the remaining specimens were from unknown gobies whose DNA did not match any of the sequencing information in the laboratory's data banks; these "unknown gobies" did not match tidewater goby DNA. Moreover, no tidewater gobies were collected in samples from the recently completed 12-month 1999-2000 impingement study. All life stages of the tidewater goby are restricted to California coastal wetlands with low salinities (< 10 ppt). The lack of a marine phase restricts the ability of this species to colonize to new areas.

Most gobies do not survive the winter storm season and those that do are usually subadults. The few fish that do survive repopulate suitable habitats in the spring (Rathburn et al., 1993).

The USFWS is currently considering de-listing of the tidewater goby in areas north of Orange County.

6.6A.2.4.3 Southern Sea Otter

The abundance of sea otters in Morro Bay is highly seasonal (Bodkin and Rathburn, 1988), and closely follows the typical pattern of late winter kelp canopy degeneration observed along much of the central California coast (USFWS, unpubl. data). During the Fish and Wildlife Service study (1988) 2,291 otter observations were recorded throughout the bay. Most of these observations occurred between the harbor mouth and what is now Tidelands Park. Sea otters are most often observed resting, feeding, and grooming in the protected waters along the sand spit west of the main channel. Foraging activities of the otters might take them into the area of the MBPP intakes. However, otters appear to avoid this busy area of the bay adjacent to the waterfront and the MBPP intake. There is no reason to expect a healthy sea otter to be adversely affected in any way by either the existing or modernized MBPP intakes. Sea otters have utilized the intake cove at the Diablo Canyon Power Plant as a resting, foraging, and mating area for years without an incident or accident associated with the operation of the power plant's intake facilities.

6.6A.2.5 Summary of Marine Biological Impacts

No significant marine biological impacts are expected as a result of modernizing the MBPP. The maximum cooling water intake and discharge flows of the Project will be reduced by approximately 29 percent, and the maximum heat load from the Project's peak power production as compared to Units 1 through 4 (now 1,002 MW) will be reduced by 25 percent. By reducing the existing facility's cooling water requirements, fewer larval fishes and shellfish will be entrained and impingement effects and discharge effects will also be reduced. The reduction in approach velocities at the intake will also reduce impingement effects.

The existing facility's cooling water system intake and discharge have been continuously reviewed as an NPDES permit condition. Results of these 5-year reviews found that the intake represents best technology available and that the discharge protects the receiving water's beneficial uses. The reduced discharge volume will have the effect of lowering the potential magnitude and extent of any existing discharge impacts. Based on our review of the existing literature and results of recent studies (July 1999 and September 2000) on the thermal effects of the MBPP discharge, impacts associated with the existing discharge are limited to modified species composition of attached algal species occupying the rocky subtidal areas of Morro Rock. From available literature and reports on the facility's intake, intake impacts expressed as rates of impingement are similar to rates at most coastal and bay facilities and significantly less than others, San Onofre Nuclear Generating Station for one. Results of the recent CWIS studies, will provide the information necessary for the RWQCBs NPDES permitting process.

6.6A.2.5.1 Intake-Related Effects

The modernized facility's reduced cooling water requirements will result in intake design flows less than those measured at the existing Units 1 and 2 intake. The modernized facility's reduced intake flows are expected to reduce the amount of debris, primarily eelgrass, collected on the intake traveling screens, and thereby lower impingement rates of juvenile and adult fishes and shellfish. The existing Units 1 and 2 approach velocities of 0.37 fps will be reduced by approximately 10 percent (to 0.33 fps) for the new combined-cycle unit during maximum water withdrawal conditions. An even greater reduction in the approach velocities (approximately 40 percent) will occur at the Units 3 and 4 intake from the current 0.51 fps to 0.30 fps for the other combined-cycle unit during peak load and maximum water withdrawal conditions. Studies which investigated the impingement of fishes and shellfish at the existing facility's approach velocities found that impingement rates of organisms were closely related to rates of debris loading on the traveling screens.

The low impingement rates of the existing facility are attributed to the shallow forebay that is located flush to the shoreline. The design and location of the intake facility minimizes potential entrapment of fishes. With the reduction in design approach velocity of the new combined-cycle intake, impingement rates are expected to be reduced even further than the current facility's existing low rate. For fish species that are strong swimmers, steelhead for one, the new intake design approach velocities of 0.3 fps essentially eliminate any potential impact of the modernized facility's intakes. By comparison, on a changing tide, the velocities of the current in front of the intake frequently exceed 6 fps, or 20 times the intake velocity.

The facility's peak intake and discharge volumes will be reduced by 29 percent. With or without the power plant, far fewer than one percent of larvae would survive natural mortality. Therefore, this reduction in peak cooling water intake volume results in a direct benefit to species of entrained larval fishes and shellfish.

6.6A.2.5.2 Discharge Plume-Related Effects

As noted above, the modernized facility is designed to use less cooling water to produce more electricity. Reduced cooling water requirements will result in a smaller sized discharge plume and therefore lower the potential extent of thermal plume effects. The facility's cooling water is discharged from a canal directly into the turbulent surf zone that produces a rapidly mixed thermal plume at the point of discharge. The plume's thermal buoyancy lifts it clear of the ocean bottom at a short distance from the end of the point of discharge. Winds and currents generally carry the surface plume in a northwesterly direction in parallel and in an offshore direction away from Morro Rock. Changing patterns in local currents associated with seasonal shifts in winds, waves, and large-scale coastal currents affect the size, shape, and direction of the plume on a given set of tide conditions. This local northerly counter-flow (gyre) along Morro Strand State Beach, which was frequently observed in past plume studies, serves to carry the surface plume away from shoreline contact (see Figure 6.5-9). The reduced-volume discharge plume of the modernized facility is expected to behave in a similar manner. With its smaller volume, the modernized facility's discharge plume will mix more rapidly, buoyantly separate from the ocean bottom in a shorter distance from the point of discharge, and because of its smaller size it will contact less linear distance of shoreline.

The modernized facility's smaller sized thermal plume will reduce the potential for discharge thermal effects, although previous studies of the receiving water's water column, ocean bottom and sandy beach habitats did not detect any plume effects. Contemporary study designs and sampling methodologies for the sand beach, rocky intertidal, and subtidal benthic surveys were reviewed and approved by the TWG. Preliminary results from these surveys conducted in the habitats listed above are attached in Appendices 6.6A-6 and 6.6A-7. The effects of elevated discharge temperatures of the existing facility's thermal plume on attached marine algae have been observed along the shoreline of Morro Rock from the point of discharge to a distance of approximately 200 m (656 feet). The reduced volume of the modernized facility's discharge is expected to reduce the potential extent and magnitude of effects compared to the existing facility's historic discharge.

6.6A.2.6 Construction Impacts

6.6A.2.6.1 Marine

There are no Project plans for construction elements that will produce effects or impacts on the marine environment or associated habitats. The demolition of the existing onsite fuel oil tanks, the construction of the combined-cycle units, and the demolition of the power building and the three 450-foot-tall stacks for Units 1 through 4 will not impact the marine environment. By reusing MBPP existing intake and discharge facilities rather than disturbing new shoreline or offshore habitat, the Project is able to avoid many numerous and potentially significant impacts to the area's marine habitats. This brownfield aspect of recycling the existing MBPP site is one of the Project's environmental strengths as particularly the case for the absence of marine construction impacts.

6.6A.3 MITIGATION

6.6A.3.1 Marine

6.6A.3.1.1 Operations Impact Mitigation

The MBPP proposed intake flows through the existing intake would minimize intake approach velocities. Based on cross-sectional area and manufacturer's pump specifications, approach velocities at the bar racks (see Figure 6.6A-3) will not exceed 0.5 fps at MSL. An intake approach velocity of 0.5 fps is a design commonly used for marine CWIS to allow most juvenile and adult fishes to escape the influence of the intake withdrawal. The velocity has been found to be generally below the escape velocity of species that have been tested. Healthy juvenile and adult fishes are commonly observed and filmed swimming at will in and out of CWIS with approach velocities considerably higher than 0.5 fps.

Operation of the MBPP Project CWIS will result in mortalities to early life stages of organisms that cannot be avoided. The effects on species populations will be mitigated, if necessary, to assure that they are not significant. Mitigation may take many forms, such as: (1) avoiding the impact to the extent practical; (2) minimizing the impact; (3) rectifying the impact; (4) reducing or eliminating the impact over time; and (5) compensating for the impact. Evaluation and selection of appropriate mitigation is conducted among participating resource and regulatory agencies at the time the Commission staff prepares the Project's PSA. Habitat compensation may be used to offset the adverse effects to fish associated with power plant operations.

6.6A.3.1.2 Construction Impact Mitigation

Construction mitigation is not necessary since there is no construction impact to the marine environment.

6.6A.3.2 Cumulative Impacts

No cumulative impacts are expected to result from the modernized MBPPs cooling water system intake and discharge. No other intake or discharge of industrial seawater occurs within 1,000 feet (0.2 mile) of the Morro Bay intake or discharge facility. Nonpoint source stormwater runoff from parking areas and roadways is expected to occur in the area of the discharge, but in such small and infrequent amounts and any potential cumulative effect is negligible. Vessels operating in the MBPP intake and discharge area entrain small amounts of ocean water in their seawater cooling water systems and create minor thermal discharges, neither of which represent any risk of MBPP cumulative impacts.

On occasion, the MBPP discharge creates on occasion a thin surface plume that can extend north along Morro Strand Beach as far as the region of the City of Morro Bay Wastewater Treatment Plant's discharge. The City's treated sewage effluent of approximately 1.95 million gallons per day (mgd) is discharged through a multiport diffuser over a mile north of the MBPP discharge. The discharge located at a depth of 50 feet (15 m) is generally warmer and less saline than the receiving water. While mixing is rapid, the discharge appears on certain occasions at the surface as a slightly warmer, less saline plume. Considering both the infrequent coincidence of the MBPP and City of Morro Bay Wastewater Treatment Plant's discharge plumes and the relatively small delta-Ts of the two plumes at their point of overlap, there is no reason to expected any cumulative, thermal impacts. Other discharge constituents occurring in the two plumes must comply with water quality based standards at each discharge's zone of initial dilution (ZID). The water quality standards are designed to protect against any degradation of receiving water quality including a wide margin of protection incorporated as an application factor used in establishing the standards. The great distance between the two discharge-ZIDs provides additional assurance against the possibility of cumulative impacts.

6.6A.3.3 Marine Resource Mitigation Measures

Based on the above analysis of impacts, and the design and operational features that have been incorporated into the Project, no mitigation measures are needed for marine biology resources.

6.6A.3.4 Marine Resources-Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to marine resources are anticipated at MBPP due to the Project (i.e., due to construction or future operation of the new combined-cycle units).

RÉSUMÉS

Qualifications of Tenera Environmental scientists who participated in the preparation of the MBPP marine biological resource surveys are listed as Appendix 6.6A-12.

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6.6B TERRESTRIAL BIOLOGY

This section presents an evaluation of terrestrial biological resources at and in the vicinity of the Morro Bay Power Plant (MBPP) and the potential effects of the Project on these resources. Marine biological resources are evaluated in Section 6.6A of the AFC. The Project site/Duke Energy property boundary consists of lands owned by Duke Energy which consist of (1) areas of the existing power plant operation (also referred to as the MBPP), (2) areas leased for urban uses (i.e., Morro Dunes Trailer Park and RV storage area, and the city ballpark), and (3) adjacent undeveloped lands (i.e., riparian woodlands, urban mix, and coastal valley grasslands/scrub community (Figure 6.6B-1).

The MBPP is an existing industrial facility that has been in operation since the early 1950s. Use of the existing MBPP as the site for the Project presents significant opportunities to avoid impacts to biological resources normally associated with new site (i.e., greenfield) development adjacent to California's coastal waters. This is because MBPP is an existing active industrial site, with limited on site habitats, which have been highly modified as part of the existing power plant operations, and as such, biological resources that occur on site are minimal. In addition, this analysis reflects the results of studies of impacts on terrestrial resources from ongoing operations that would otherwise be unavailable in a greenfield site evaluation. Duke Energy has coordinated and continues to coordinate with various regulatory agencies including, but not limited to, the U.S. Army Corps of Engineers (Corps), U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service, U.S. Coast Guard, Regional Water Quality Control Board (RWQCB), California Energy Commission (CEC), California Coastal Commission (CCC) and California Department of Fish and Game (CDFG). This coordination identifies and focuses study efforts to collect data, and to update and supplement prior studies and related permit applications in order to determine if potentially significant impacts to terrestrial resources could occur as a result of the proposed Project. The results of these efforts indicate that no known direct significant impacts to sensitive species will occur. Potentially significant mitigable impacts to sensitive terrestrial resources could occur, but these impacts are minimal and mitigable, and are generally limited to already highly modified habitats within the existing active industrial site.

This Terrestrial Biology Section is organized into three main subsections. Section 6.6B.1 provides information on Existing Conditions and includes discussions of the underlying methodology, vegetation and wildlife habitats, sensitive habitats, and rare and endangered plants and animals. Section 6.6B.2 evaluates Terrestrial Biological Impacts and Mitigation Measures. Section 6.6B.3 sets forth relevant Laws, Ordinances, Regulations and Standards related to the site's terrestrial biology. Section 6.6B.4 lists references consulted by the authors of the Biological Survey (Appendix 6.6B-1) and by the authors of this Terrestrial Biology section of the AFC.

The species and habitat information in this Section 6.6B is based on information set forth in the Terrestrial Biological Survey dated October 2000 and prepared by Francis Villablanca, Ph.D. and V.L. Holland, Ph.D. of California Polytechnic State University (Cal Poly) San Luis Obispo, a copy of which is attached hereto as Appendix 6.6B-1. Similarly, impact evaluations and mitigation measures are based on information from the Terrestrial Biological Survey and on data obtained from analyses performed for other sections of this AFC, including air quality, noise and traffic.

Potential impacts have been evaluated using significance criteria based on California Environmental Quality Act (CEQA) Guidelines. Applying these criteria, no potentially significant impacts were identified that could not be mitigated.

Design features which provide mitigation for all impacts evaluated as potentially significant mitigable impacts are identified, and include:

- Qualified biological on site monitors during certain construction activities;
- Coastal Dune Scrub Restoration/Enhancement Plan;
- Exclusionary fencing or established exclusion zones for certain areas;
- Worker Environmental Awareness Program;
- Stormwater Pollution Prevention Plan;
- Erosion Control Plan;
- Continued agency coordination on fox removal program;
- Construction of a sound wall; and
- Directed and shielded lighting.

6.6B.1 EXISTING CONDITIONS

6.6B.1.1 METHODOLOGY

The Terrestrial Biology Section of this AFC is based on information set forth in the Terrestrial Biological Survey dated October 2000 and prepared by Francis Villablanca, Ph.D. and V.L. Holland, Ph.D. of California Polytechnic State University (Cal Poly) San Luis Obispo, a copy of which is attached hereto as Appendix 6.6B-1. Reumes for Messrs. Villablanca and Holland are included within Appendix 6.6B-1. The findings set forth in the Terrestrial Biological Survey are based on field reconnaissance activities, species-specific surveys, database searches, consultation with Cal Poly faculty members, and literature reviews conducted by or in consultation with Messrs. Villablanca and Holland.

Primary terrestrial field reconnaissance surveys of the Project site were conducted by Dr. Villablanca (wildlife) and Dr. Holland (botany) between January and March 1999, and occurred over five to seven-day periods during each month. The field surveys consisted of canvassing the area within the MBPP site and the immediately surrounding area on foot and recording the plant and wildlife species that were in identifiable condition. Areas within the one-mile radius of the MBPP to which there was access were examined, and previous botanical and wildlife studies conducted in areas within the one-mile radius were used as a reference. Resumes for Francis Villablanca and V.L. Holland are included within Appendix 6.6B-1. Resumes for the preparers of this Terrestrial Biology Section of the AFC are included in Appendix 6.6B-2.

The field surveys consisted of canvassing the area within the MBPP site and the immediately surrounding area on foot and recording the plant and wildlife species that were in identifiable condition. Areas within one-mile of the MBPP to which there was access were examined, and previous botanical and wildlife studies conducted in areas within the one-mile radius were used as reference. The wildlife field survey was conducted by noting all wildlife observed, and signs of wildlife such as dens, tracks, scat, carcasses, etc., within the MBPP site. Adjoining coastal dune, estuarine and riparian habitats were also surveyed for wildlife species. The wildlife survey was conducted to ascertain the presence of sensitive wildlife species or sensitive habitats. Plant communities and wildlife habitats within the one-mile radius were described. A list of the plant species found during the on site survey, as well as a list of wildlife known or expected to occur on, or immediately adjacent to, the Project site are included in Appendices 1 and 2, respectively, of Appendix 6.6B-1. In the case of some wildlife species, their current distribution within and immediately adjacent to the MBPP was not known. Many species-specific census efforts were directed at identifying the local distribution of these species. These species-specific surveys are also described below.

In addition to fieldwork, the Terrestrial Biological Survey identifies information obtained from database searches performed by the Survey authors. More specifically, on March 30, 1999, and June 16, 2000, the authors queried the California Natural Diversity Database (CNDDB) maintained by the CDFG to identify sensitive habitats or species within the database that are known to occur within the Morro Bay North and Morro Bay South USGS quadrangles.

CDFG maintains records for the distribution and known occurrences of sensitive species and habitats in the CNDDB. Sensitive species include those species listed by the federal and state governments as endangered, threatened, or rare or candidate species for these lists. Species of special concern are also considered to be sensitive species by the CDFG, and are included in the database. The CNDDB is organized into map areas based on 7.5 minute topographic maps produced by the U.S. Geological Survey. All known occurrences of sensitive species and important natural communities are mapped onto the quadrangle map. The database gives further detailed information on each occurrence, including specific location of the individual, population, or habitat (if possible) and the presumed current state of the population or habitat.

In addition, the survey authors consulted a list of "special animals" maintained by CDFG to identify species on the list that are known or suspected to occur within the Morro Bay North and Morro Bay South quadrangles. Included on the list of "special animals" are California state-listed species (endangered, threatened, candidate for listing, sensitive, and special concern), and federally listed species (endangered, threatened, proposed for listing, candidate for listing, and special concern). The list also includes any species that are on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List, or on Audubon Society Watch lists. Species noted on any of these lists are relevant to the Commission's CEQA equivalent review of the Project.

The CNDDB search resulted in the identification of 11 species for further consideration. A review of the CDFG Natural Heritage Division's "special animals" list identified an additional 27 species that required further consideration. Surveys for specific wildlife species were conducted between May 29 and July 6, 1999, between February 11 and 15, 2000, and between June 6 and August 7, 2000. The specific methodologies employed (and the exact dates of the surveys) are presented below and the results are summarized below. In some cases, no specific survey was conducted because the geographic distribution of a species was determined from a review of the current literature, or was already known to the authors of the Terrestrial Biological Survey.

6.6B.1.2 REGIONAL OVERVIEW OF VEGETATION AND WILDLIFE HABITATS

The MBPP is an existing 107-acre industrial complex surrounded by light industrial, coastal dependent industrial, commercial, marine, residential, and recreational land uses. Highway 1 runs along the eastern boundary of the site. Embarcadero Road, Morro Dunes Trailer Park and RV storage area, Estero Bay, Morro Rock, and the Pacific Ocean are to the west of the site. A mobile home park, a fishermen's gear storage area, Lila Keiser Park, and Morro Creek are located on the north side of the site. Just south are residences (approximately 900 feet from the edge of the existing power building for Units 1-4), the Veteran's Hall (approximately 780 feet from the edge of the existing power building for Units 1-4), and Embarcadero Road. The City of Morro Bay extends to the east of MBPP. Morro Rock, a large outcropping projecting out of Morro Bay approximately ½ - mile west of the Project site, is a visually distinctive landmark along the coast.

Figure 6.6B-1 shows the regional terrestrial habitats of the area within a 1-mile radius of the site. The MBPP is situated along the coastal edge of the Santa Lucia Range, the local portion of the South Coast Range of California.

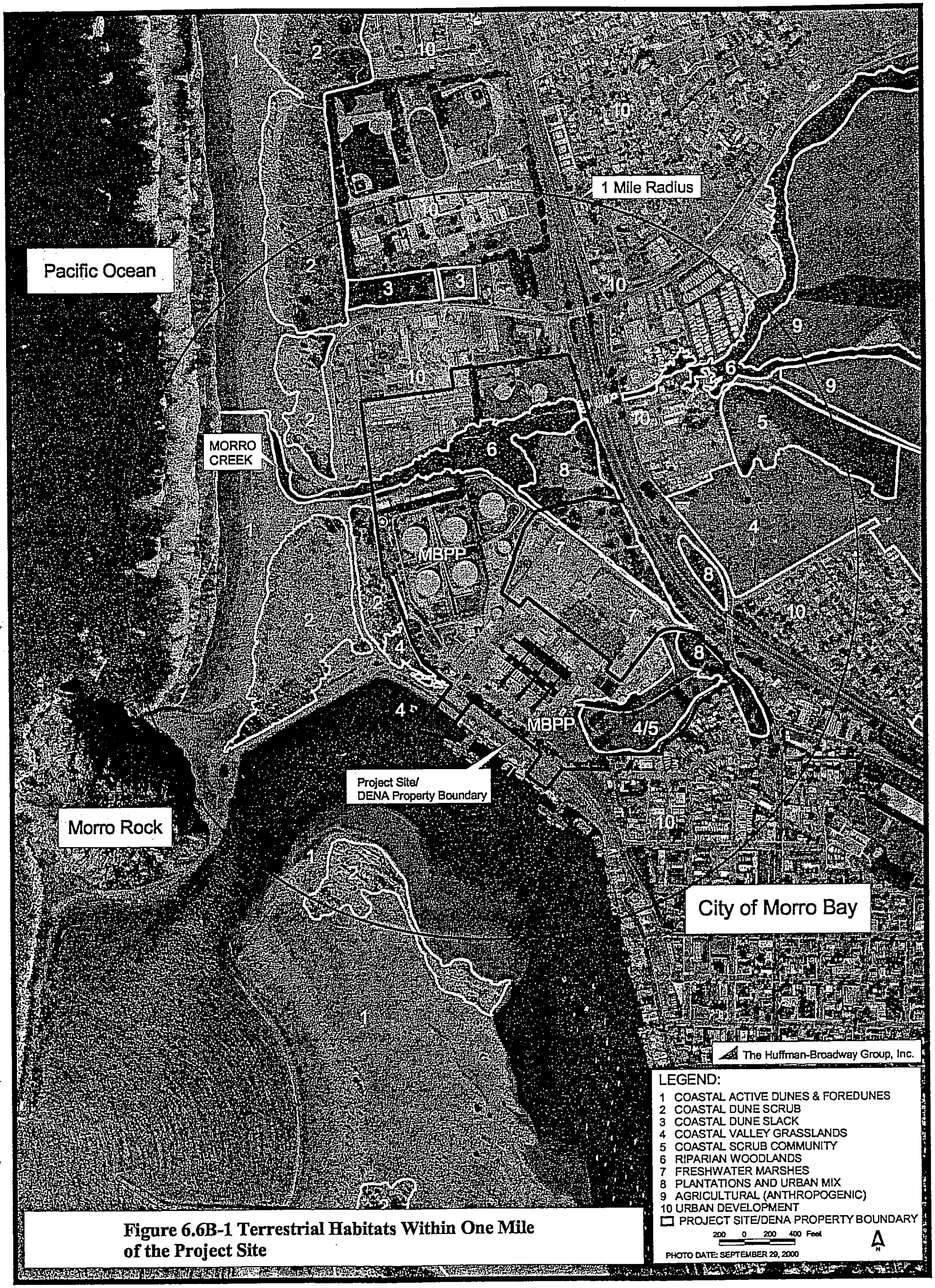

Figure 6.6B-1 Terrestrial Habitats Within One Mile of the Project Site

The vegetation and wildlife habitats in the vicinity of MBPP have developed in response to the interaction of a complex of environmental features. Climate (wind, temperature, rainfall, fog, etc.) topography, soils, parent materials, biotic components, fire, location of waterways, coastal tides, and natural historical events have all affected the vegetation and wildlife habitats of the Project area. Past and present land use and human related events including urban development have resulted in major changes in the vegetation. As a result, the natural vegetation and wildlife habitats within approximately a one-mile radius of the MBPP are comprised of a complex mosaic of terrestrial; semi-aquatic and aquatic (both freshwater and saltwater) plant communities. The terrestrial communities are coastal strand and foredunes, coastal dune scrub, coastal scrub, and grassland. Chaparral and coast live oak communities occur near the MBPP but outside the one-mile radius. The semi-aquatic and aquatic communities consist of coastal dune slacks, riparian, freshwater marsh, coastal salt marsh, mudflats, and estuarine communities. Added to this are the numerous plants introduced to the Morro Bay area as ornamentals, windrows, crops and weeds. Some of these trees are native to California but not to the Morro Bay area (such as Monterey pines and cypresses).

Morro Bay is an estuarine community with significant water level variations as the tides move in and out of the bay. The City of Morro Bay has designated the city as a bird sanctuary and the bay is a part of the National Estuary Program. Near MBPP and the City of Morro Bay, fill and riprap along the banks have modified the shoreline of the bay. Vegetation along the banks consists largely of disturbed, weedy species, although some areas support a sparse, native coastal scrub cover. Areas of the bay southeast of MBPP support extensive mudflats and coastal salt marsh vegetation. Salt marsh and tidal mudflat development occurs where fine sediments, brought in by creeks (e.g., Los Osos Creek), have accumulated and reached an equilibrium with mean ocean tides. These areas are covered by seawater during high tides and exposed during low tides. In other areas where freshwater enters the bay via creeks or springs, freshwater marsh and riparian communities occur along the shoreline of the bay (e.g., Sweet Springs). The freshwater marsh and coastal salt marsh intergrade with each other in areas where ocean tides mix with freshwater from terrestrial environments forming a mixture of the two communities. This gradation from freshwater marsh to salt marsh is common around the shoreline of the bay near South Bay Blvd. Urban development around the bay has also resulted in plantations of tall trees such as blue gum that provide habitat and roosting sites for Monarch butterflies and various species of birds.

As a result of habitat diversity, the wildlife diversity in and near Morro Bay is also quite high. Many of the species are specialists, restricted to one particular plant community or habitat type. Morro Bay itself is an important breeding and wintering area for a large diversity of birds. Various freshwater aquatic habitats allow the maintenance of a rich amphibian diversity.

The abundance of sandy substrates is also significant in maintaining species diversity. It is particularly important for burrowing organisms. Overall, the wildlife diversity parallels the plant species diversity.

6.6B.1.3 PROJECT SITE OVERVIEW

The Project site, which is owned by Duke Energy, consists of 107 acres. The MBPP portion of the site, which is the location of the proposed development, consists of 57 acres. Much of the MBPP site was subject to deposits of gray-brown silty sand hydraulic fill that was dredged locally and placed on the tidal flats and alluvial plains of Morro Creek by the U.S. Navy in 1941 and 1942. This fill raised the elevation of the alluvial deposits and the site to 15feet above mean sea level (msl). As a result of past fill and development and current use of the site, vegetation and wildlife habitats on most of the MBPP have been highly modified and do not support high quality wildlife habitat. Much of the habitat is a mosaic of highly disturbed, weedy plant assemblages, ornamental plantings, and windrows of planted exotic and native trees intermixed with power plant facilities. There are a few patches of willows found in the northeastern portion of the site and a few small patches of recovering coastal dune scrub on the hillside and borrow area in the southern portions of the site. Corridors of riparian woodland occur along sections of the northern and northeastern boundaries of the MBPP (associated with Morro Creek and Willow Camp Creek. However, much of this riparian woodland along Morro Creek and Willow Camp Creek is disturbed and mixed with various tree plantings and ornamentals. Though the remaining habitats at the MBPP site are modified, the site in general is contiguous with some relatively undisturbed habitats (Figures 6.6B-1 and 6.6B-2a). The Morro Bay area in general is characterized by high biotic diversity. The MBPP site's biotic diversity and habitat value is mainly due to its proximity and abutment with various communities, such as riparian woodlands and coastal dune scrub habitats.

6.6B.1.4 EXISTING VEGETATION AND WILDLIFE COMMUNITIES

This section discusses regional vegetation and wildlife. Regional biological resources are those that occur within a five-mile radius of the MBPP. For each of the resource types it is also indicated whether they also occur within a one-mile radius of the MBPP.

The vegetation and wildlife habitats that occur within a one-mile radius of the MBPP have been divided into ten ecosystems: (1) Coastal Active Dunes and Foredunes; (2) Coastal Dune Scrub; (3) Coastal Dune Slack; (4) Coastal Scrub including Rock Outcrops; (5) Coastal Valley Grassland; (6) Riparian Woodlands; (7) Freshwater Marsh; (8) Coastal Salt Marsh and Tidal Mudflats; (9) Plantations and Urban Mix; (10) Anthropogenic. The vegetation and wildlife within each of these ecosystems is discussed below from a regional perspective and also in relation to the Project site. Terrestrial habitats on the Project site are shown in Figure 6.6B-2a. The wildlife species that occur or are expected to occur on the MBPP site or in habitats adjacent to the MBPP are indicated in Appendix 6.6B-1, Appendix 2. This appendix also identifies the species that were actually observed, as well as the listing status of each species (if any).

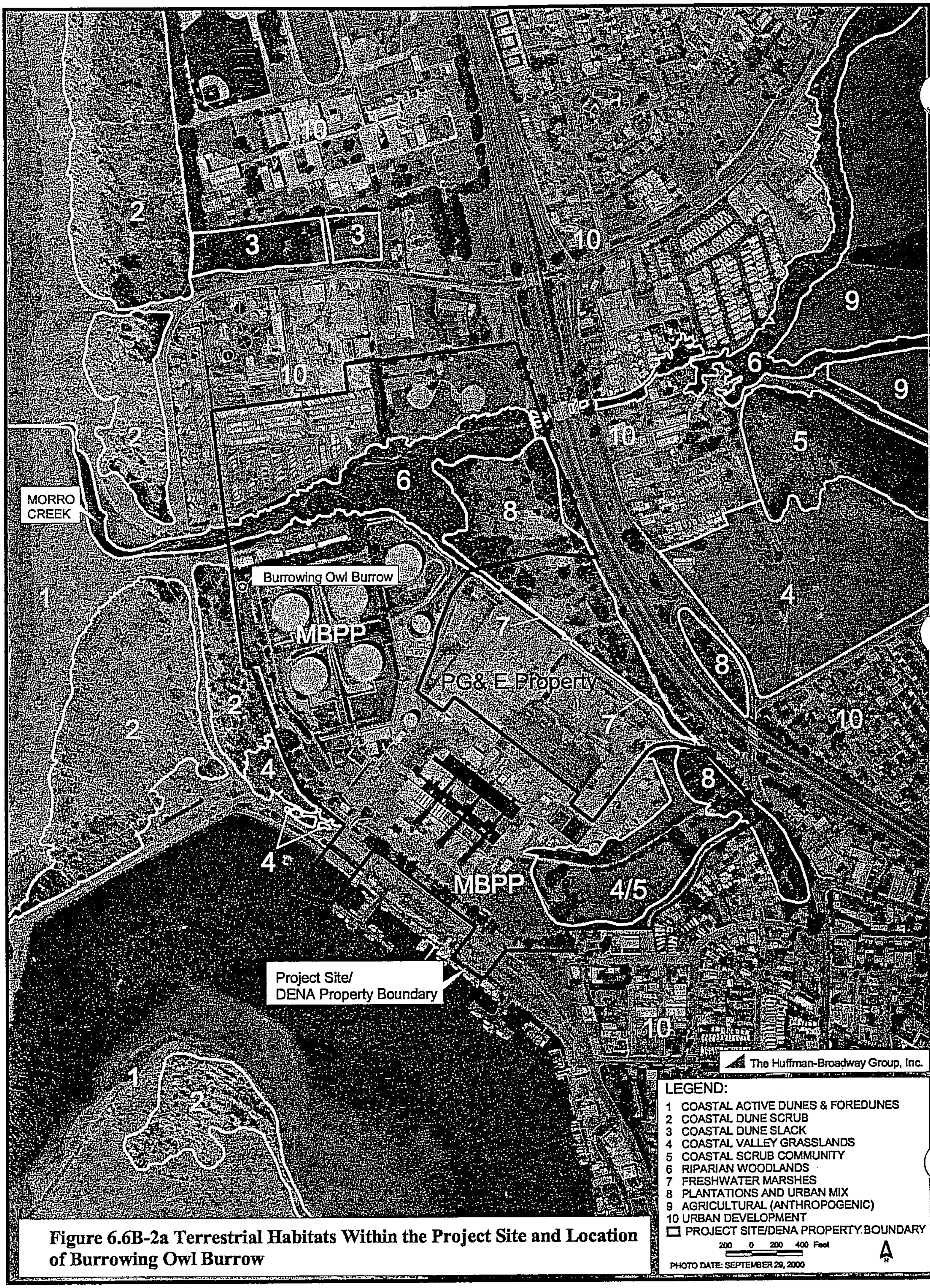

Figure 6.6B-2a Terrestrial Habitats Within the Project Site and Location of Burrowing Owl Burrow

6.6B.1.4.1 Coastal Active Dunes and Foredunes

Regional Vegetation

Coastal dunes form when sea breezes blow sand grains inland from the beaches where the sand has been cast ashore by the surf. The areas immediately along the ocean do not support plants because waves regularly cover the areas during high tides. This area is referred to as the coastal strand, or beach. Once the sand has been blown above the high tide level, colonization of the bare sand by dune-building pioneer plant species can occur. Examples of this can be seen in the unstabilized dune complex along the immediate ocean. Pioneer plants growing on active dunes tend to collect sand and form vegetated hummocks. If enough plants become established to significantly reduce the rate of air movement along the sand surface, dune movement will slow or stop. Species of plants intolerant of rapid burial can become established once a dune has stopped moving. Once this happens, the dune is considered stabilized and will progress to the next stage of dune succession which is coastal dune scrub (discussed next). This process will then continue until the climax stage of vegetation development is reached.

Coastal strand and pioneer dunes within one-mile of MBPP occur along a continuous, narrow corridor of sand dunes that comprise Atascadero State Beach along Estero Bay from Morro Rock northward. These are the first terrestrial plant communities above the high tide line. Only the most salt-tolerant species are able to grow immediately adjacent to the beach and the high tide line. Often these plants do not become established and last for only a short period of time.

Where plants become established for longer periods, pioneer or foredune communities develop on small hillocks directly facing the ocean just inland from the beaches. These hummocky foredune communities are discontinuous and separated by areas of active dunes. However, the zone of foredune communities forms a continuous corridor just inland from the beach along Estero Bay (Atascadero State Beach) and on the sand spit across the harbor entrance from the MBPP. There is often a marked overlap and zonation in coastal strand, coastal active dunes, and foredune communities.

Because of the harsh environmental conditions, foredune communities, like the strand, usually have low species diversity and a patchy, hummocky distribution. This plant community is also subjected to a relatively high level of natural disturbances such as wave battering during storms, salt laden winds, and fast moving, abrasive sand. As a result, the plants are mostly prostrate herbs with creeping stems. Most are able to root at the nodes, and vegetative reproduction often results in large colonies developing from a single original plant. These plants are tolerant of repeated burial by shifting sands. The root systems are usually extensive, and long taproots may exploit deep-seated water supplies. These growth features result in an interlaced system of buried roots and stems that bind the sand, reduce wind erosion, and stabilize the dune.

The species that occur on the coastal strand and foredune communities include a variety of native and introduced species. The most common plants are listed below.

Abronia latifolia	yellow sand-verbena
Abronia maritima	beach sand-verbena
Ambrosia chamissonis	beach-bur
Ammophila arenaria	European beach grass
Atriplex californica	salt bush
Cakile maritima	sea-rocket
Calystegia soldanella	dune morning glory
Camissonia chieranthifolia	dune evening primrose
Carpobrotus chilensis	ice plant
Carpobrotus edulis	ice plant
Cryptantha clevelandii	Cryptantha
Eriophyllum multicaule	Eriophyllum
Lessingia filaginifolia	California-aster
Lupinus chamissonis	coastal silver lupine
Senecio blochmaniae	Blochman's groundsel

Several rare plants occur in these plant communities in the general area around Morro Bay, such as *Dithyrea maritima* (beach spectable pod), *Monardella undulata* (curley-leaf monardella) and *Malacothrix incana* (dunedelion) which are discussed in detail later. Also, several introduced species are now widespread as members of foredune communities. *Ammophila arenaria* (European beach grass) has been planted so extensively on much of the dune complex between Estero Bay from the MBPP north that it is the dominant species over much of the area. It has been planted in many locations in the dunes of Atascadero State Beach northwest of MBPP near Morro Bay High School but only in a few locations on the sand spit. Where European beach grass occurs, it usually completely dominates the area to the exclusion of native plants. It is also spreading naturally in many of these areas further reducing the potential colonization by native plants. Other introduced plants that create similar problems for the native plant re-establishment are *Conicosia pugioniformis* (slender-leafed ice plant) and *Carpobrotus edulis* (ice plant).

On a few of the dunes northwest of MBPP, there are several thickets of *Salix lasiolepis* (arroyo willows) that occur on the unstabilized, open sand. Because these areas are not currently wetlands, their occurrence here is not completely understood. It is possible that there was once a wetland here that became engulfed by the moving dune, and the willows, being tolerant to burial, were able to maintain remnant thickets in an otherwise unstabilized dune. Another possibility is that willow seedlings could become established during a very wet year in which the sand was moist enough for a long enough period of time for the roots of the willows to reach the water table and become established. Once established, the willows maintained themselves because of their ability to tolerate moving sands by producing new adventitious roots on the newly buried stems. There are also more extensive areas of arroyo willows in the dune slack communities which are wetland areas and will be discussed later.

Stabilization of dunes is a lengthy process and may be reversed by changing environmental conditions. Because of the instability of sandy soils, disturbances that remove the vegetative cover can cause a previously stabilized dune to become active. These changes may come about as a result of natural disturbances such as storms or fire, or as a result of human activities. Wind erosion of previously stabilized dunes results in the formation of blowouts where the sand is stripped away from roots and buried stems of dune-stabilizing plants. This may cause the death of the plants and the degradation of established plant communities. Once a dune has become destabilized, wind may cause it to shift its position and to engulf plants growing in its path. On such an active dune only pioneer species or plants that have survived the effects of shifting sands will grow.

Lacking disturbances, once the pioneer dune community stabilizes the dune, and the soil surface becomes more stable and protected from the direct winds, soil development starts to take place. The soils gradually accumulate more organic matter, retain more water, become more fertile and decrease in salt content. As the soil becomes more favorable, the coastal dune scrub community, which is discussed below, gradually replaces the pioneer dune community. Pioneer dunes and coastal dune scrub grade into one another in the dune complex along Estero Bay and on the Morro Bay Sand Spit.

Regional Wildlife

The instability and disturbed nature of the coastal strand and foredunes make it a valuable habitat area for wildlife. The primary occupants of this area are shorebirds. Near-shore habitats overlap with the coastal strand and include offshore rocks, and the surf zone. Marine birds are common and abundant in this habitat belt. The foredune is also a valuable resource for some shorebirds that use such habitats for nesting. A list of the major occupants of the near shore marine, coastal strand and foredune habitats is presented below:

Black-bellied plover	Ring-billed gull
Semipalmated plover	California gull
Killdeer	Western gull
Spotted sandpiper	Bonaparte's gull
Marbled godwit	Herring gull
Red knot	Glaucous-winged gull
Western sandpiper	California brown pelican
Least sandpiper	Sanderling
Dunlin	Western snowy plover
California least tern	Willet
Double-crested cormorant	White Pelican
Marbled murrelet	Surf scoter

Brown pelicans are common in and beyond the surf zone. This is in part due to offshore rock formations that provide safe landing and nesting areas. Double-crested, pelagic and Brandt's cormorants are frequently sighted on the same offshore rocks. The pioneer dunes provide an extensive breeding and nesting area for snowy plovers. Breeding populations are known from this site and are regularly protected with fencing and postings. These same dunes are occasional breeding habitats for least terns.

Vegetation on Morro Bay Power Plant Site

There are no coastal strand or coastal foredune communities on the MBPP site itself, but they do occur within one-mile of the power plant on the Morro Bay Sand Spit and along Estero Bay. The sand spit has relatively undisturbed dune communities with only a few areas of European beach grass. However, much of the dune complex from MBPP northward along Estero Bay has been highly disturbed and many areas are completely dominated by European beach grass and ice plant to the exclusion of most natives. There are some areas, however, dominated by native sand dune plants where disturbance has not been as great. The preceding regional discussion covers these areas in more detail.

Wildlife on Morro Bay Power Plant Site

All of the species found on offshore rocks, surf zone, coastal strand and foredunes may occasionally be found on site at the MBPP. Certainly, they do not distinguish on and off site in terms of their aerial distributions. Carcasses of surf scoters, gulls, and pelicans were found west of the tank farm (and within the MBPP property) and indicate that either these birds fell to predation on site, or were dragged in from not far off site. There is no dune habitat that could be used by snowy plovers or least terns on site.

6.6B.1.4.2 Coastal Dune Scrub

Regional Vegetation

Dune scrub communities are generally located inland from the foredune communities or on the lee side of tall dunes and are successionally older and more integrated communities than foredune communities. Because they are usually located in the wind-shadow of the foredunes or in areas away from the immediate coast, and because they have a well-developed vegetative cover, dune scrub communities have soils which are considerably more stable than those of foredune communities. The soils of dune scrub communities have more organic matter, retain more water, are more fertile, and have a lower salt content than soils of foredune communities. Shade and litter from the vegetation greatly reduce the reflectivity and temperature fluctuation of the soil. Sometimes a thin, fragile surface layer of mosses and lichens binds the sand particles together.

Dune scrub communities typically have greater species diversity than do foredune communities, and the vegetation is usually denser and taller. The dune scrub varies in species composition and structure from place to place, and like the foredunes, differences in cover and species composition are common on the windward and leeward side of the backdunes. However, the general aspect of the vegetation is a relatively continuous cover of low to medium shrubs (usually less than one meter tall), subshrubs and herbs, with shrubs being the dominant vegetation. Patches of coastal dune scrub are found within one-mile of the MBPP on the leeward side of the Morro Bay Sand Spit and the dune complex comprising Atascadero State Beach (along Estero Bay). Much of the relatively undisturbed dune scrub around the Morro Bay area, including areas within one-mile of MBPP such as the sand spit, is dominated mostly by a mixture of the native plants listed below. However, the coastal dune scrub between Morro Rock and the MBPP has been highly disturbed and is a mixture of a few scattered native species (especially coastal bush lupine) and many introduced and exotic species such as ice plant and acacias. Common plants of the coastal dune scrub are listed below:

Abronia umbellata	purple sand-verbena
Artemisia californica	California sagebrush
Baccharis pilularis	coyote bush
Ceanothus cuneatus	buckbrush
Cirsium occidentale	cobwebby thistle
Croton californicus	croton
Eriastrum densifolium	woolly gilia
Ericameria ericoides	mock heather
Eriogonum parvifolium	coastal buckwheat
Eriophyllum staechadifolium	coastal golden-yarrow
Eriophyllum confertiflorum	common golden-yarrow
Erysimum insulare var. suffrutescens	San Luis Obispo wallflower
Heteromeles arbutifolia	toyon
Horkelia cuneata	horkelia
Lessingia filaginifolia	California aster
Lotus scoparius	deerweed
Lupinus arboreus	tree lupine
Lupinus chamissonis	coastal silver lupine
Mimulus aurantiacus	sticky monkeyflower
Prunus fasciculata var. punctata	sand almond
Quercus agrifolia	coast live oak
Rhamnus californica	Coffeeberry
Salvia mellifera	black sage
Senecio blochmaniae	Blochman's shrubby groundsel
Solanum xanti	purple nightshade
Toxicodendron diversilobum	poison oak

Herbaceous species are also common components of dune scrub communities and these include:

Abronia umbellata	purple sand-verbena
Amsinckia spectabilis	fiddleneck
Cardionema ramosissima	sand mat
Castilleja exserta	Indian paintbrush
Cirsium occidentale var. occidentale	cobweb thistle
Cryptantha clevelandii	cryptantha
Dudleya lanceolata	dudleya
Eschscholzia californica	California poppy
Horkelia cuneata	Horkelia
Mucronea californica	California spineflower
Solanum douglasii	black nightshade

Much of the Morro Bay Sand Spit has relatively pristine coastal scrub vegetation on the lee side of the dunes. However, most portions of the coastal dune scrub immediately around the MBPP have been fragmented by various disturbances. These disturbed sites have also opened the dunes to invasion by a large number of introduced plants such as:

Bromus diandrus	rip gut brome
Bromus madritensis var. rubens	red brome grass
Carpobrotus chilenis	ice plant
Carpobrotus edulis	ice plant
Conicosia pugioniformis	slender-leafed ice plant.
Ehrharta calycina	veldt grass
Raphanus sativus	wild radish

These species are not likely to all be found together at any one site. Coastal dune scrub is a variable community and species composition is dependent on several variables. These include: proximity to the ocean or to Morro Bay, the amount and exposure to the wind, the direction and steepness of sloping terrain, the length of time that succession has been taking place, the amount and type of disturbance that has taken place in the past, and the degree of soil development.

Most of the coastal dune scrub in the immediate vicinity of MBPP has been highly disturbed or removed. Coleman Park, roads, and parking lots have been developed on the back dunes that may have historically supported coastal dune scrub prior to filling, planting of ornamentals, and planting of vast areas in European beachgrass. The European beach grass is so dominant in many areas that few native plants are found. However, some of the back dunes support an open coastal dune scrub comprised of various mixtures of the following species:

Artemisia californica	California sagebrush
Baccharis pilularis	coyote bush
Croton californicus	croton
Ericameria ericoides	mock heather
Eriogonum parvifolium	coastal buckwheat
Lessingia filaginifolia	California aster
Lupinus chamissonis	silver lupine
Senecio blochmaniae	Blochman's shrubby groundsel

Associated herbs include:

Abronia umbellata	purple sand-verbena
Amsinckia spectabilis	fiddleneck
Bromus diandrus	rip gut brome
Bromus madritensis var. rubens	red brome grass
Cardionema ramosissima	sand mat
Carpobrotus chilensis	ice plant
Carpobrotus edulis	ice plant
Conicosia pugioniformis	slender-leafed ice plant
Cryptantha clevelandii	cryptantha
Dudleya lanceolata	dudleya
Ehrharta calycina	veldt grass
Mucronea californica	California spineflower
Raphanus sativus	wild radish
Solanum douglasii	black nightshade

Many weedy species have invaded the disturbed areas of coastal dune scrub. A particularly invasive plant is *Ehrharta calycina* (veldt grass), an African species that tends to replace the native shrubs following disturbance and to prevent their recolonization. Other common invaders include species of ice plants (*Carpobrotus edulis, Carpobrotus chilensis*, and *Conicosia pugioniformis*).

Several rare and endangered plants occur in the coastal dune scrub vegetation. These include *Prunus fasciculata var. punctata* (sand almond), *Monardella undulata var. undulata* (curly-leafed monardella), *Erigeron blochmaniae* (Blochman's leafy daisy), and *Erysimum insulare var. suffrutescens* (San Luis Obispo wallflower). Some populations of these plants occur on disturbed lots in the urbanized portions in the Los Osos area and others in the comparatively undisturbed vegetation around the urban fringes.

Regional Wildlife

The wildlife species found in coastal dune scrub are highly variable from patch to patch. This is in part because the patches are interspersed within other habitat types, and may not be stable in time. Often the species composition is as much a function of the age of a patch as its proximity to other patches. Since many of these patches occur in a mosaic of habitat types, species that are characteristic of other habitat types may be found within patches of coastal dune scrub.

Below is a list of the most common and characteristic wildlife species found in coastal dune scrub.

Dune snail	Loggerhead shrike
Morro Bay blue butterfly	Yellow-rumped warbler
Western fence lizard	California towhee
Horned lizard	Spotted towhee
Legless lizard	White-crowned sparrow
Gopher snake	Golden-crowned sparrow
Western rattlesnake	American goldfinch
Turkey vulture	Lesser goldfinch
Cooper's hawk	House finch
Sharp-shinned hawk	House sparrow
Red-tailed hawk	Brush rabbit
American kestrel	Desert cottontail
California quail	California ground squirrel
Mourning dove	Botta's pocket gopher
Burrowing owl(and burrow)	Black-tailed jackrabbit
Anna's hummingbird	California pocket mouse
Rufous hummingbird	Morro bay kangaroo rat
Allen's hummingbird	Western harvest mouse
Western kingbird	California mouse
Black phoebe	Deer mouse
Western scrub jay	Brush mouse
Western crow	Monterey dusky-footed woodrat
Bushtit	Coyote
Bewick's wren	Grey fox
Wrentit	Red fox

Northern mockingbird	Longtailed weasel
California thrasher	Badger
Bobcat	Striped skunk
Mule deer	

Vegetation on Morro Bay Power Plant Site

There is a small patch of highly disturbed coastal dune scrub in the southwestern corner of MBPP near Tanks 3 and 4. This small area is part of the larger dune complex that extends up around Estero Bay. Much of the coastal dune scrub on site is composed of dense mats of *Carpobrotus edulis* and *Carpobrotus chilensis* (ice plants); however, there are some species typical of coastal dune scrub scattered throughout this area such as those listed below.

Baccharis pilularis	coyote bush
Croton californicus	Croton
Ericameria ericoides	mock heather
Lessingia filaginifolia	California aster
Lotus scoparius	Deerweed
Lupinus chamissonis	coastal silver lupine
Senecio blochmaniae	Blochman's shrubby groundsel
Solanum xanti	purple nightshade

There are also several weedy introduced plants in this area such as *Bromus diandrus* (rip gut brome) and *Raphanus sativus* (wild radish).

Wildlife on Morro Bay Power Plant Site

The areas of coastal dune scrub wildlife habitat are small, fragmented and degraded. Probably no species can maintain a viable population in a single area.

Dune snail shells were discovered in the tank farm area, however, none of these shells were the Morro shoulderband snail. All shells found were of the non-threatened con-generic Big Sur shoulderband snails. Overall, vegetated areas of the tank farm are probably suitable habitat for the Morro shoulderband snail. Species-specific surveys were conducted for the Morro shoulderband snail and these efforts are discussed below. Despite these efforts, no live snails or their shells were detected.. Mitigation measures are provided in the Impacts and Mitigation Section for potential impacts to the species and this species' potential habitat.

A second species of concern that might occur in this small area is the legless lizard. Given that no signs of any individuals were discovered in the reconnaissance phase, a survey was conducted for this species. The specific efforts made to detect this lizard are likewise discussed in the species-specific survey section below. Again, however, no individuals were detected.

A burrowing owl and its den was discovered adjacent to the tank farm. The den was not observed for any period of time during the reconnaissance phase and thus it is unknown how many individuals it houses. The den is most likely a wintering den since burrowing owls are generally only winter residents along the central region of the San Luis Obispo County Coast. Along the north coast of the county they may be year round residents. A species-specific survey (see below) was conducted to determine if the burrow was a breeding burrow in addition to being a wintering burrow. Based on that survey, the burrow appears to be a wintering burrow only.

Red foxes have been documented as occurring on the Project site. On site observations have indicated that the red fox on site is a Central Valley red fox and not the red fox of the Sierra Nevada. The red fox of the Sierra Nevada populations is a state-listed threatened species. The red fox more typically associated with the Central Valley portion of California are known to be extending their range west, and have recently been sighted in eastern portions of San Luis Obispo County and in Southern Monterey County. Central Valley red foxes are not native and their predatory activities can adversely affect native wildlife populations. Mitigation for potential impacts to special status wildlife species related to the red fox is presented in the Impacts and Mitigation Section.

6.6B.1.4.3 Coastal Dune Slack

Regional Vegetation

Some of the coastal dune areas around Morro Bay have small to large depression areas where the dune surface is at or near the water table. These areas are sometimes called deflation areas, plains, dune hollows or dune slacks, depending on the distance from the water table. These depressions in the dunes have areas that vary from being a few feet below the water table (ponds, freshwater marshes) to being a few feet below the soil surface. Where the water table is shallow but below the soil surface, the soil is slightly to moderately more moist than the surrounding dune slopes, but not moist enough to support true aquatic plants. These areas are often referred to as coastal dune slacks.

These communities are at the dry end of the gradient for wetland communities and often are composed of a mixture of semi-aquatic and terrestrial plants. Where the water table is shallow, semi-aquatic phreatophytes, plants with high moisture requirements and the ability to tap the fringe of the water table dominate the community. Coastal dune swales are somewhat transitional (ecotonal) in nature and also represent later stages of wetland succession. They are intermediate between the "true" wetlands and the surrounding terrestrial communities. With time and more sand deposits, these areas will gradually become dune scrub communities. At the wetter end of the gradient, coastal dune swale communities overlap with freshwater marsh communities and are common along the drier fringes of these wetlands. Many of the species of the coastal dune swale occur as understory in the Riparian Woodland communities in the dunes.

Coastal dune slack communities in the dune complex within one-mile of the MBPP are found in patches in the backdunes north of the MBPP. In many of these areas there are patches of *Salix* *lasiolepis* (arroyo willows) with various wetland species such as *Juncus lesueurii* (salt rush) and *Carex pansa* (sedge). A large dune slack dominated by dense arroyo willows occurs along the southern boundary of Morro Bay High School along the north side of Atascadero Road. Other large patches of arroyo willows occur along the back dunes west of the new Cloisters Development north of the high school. Common associates of the arroyo willows include:

Baccharis douglasii	marsh baccharis
Baccharis pilularis	coyote bush
Cotula coronopifolia	brass buttons
Cyperus eragrostis	umbrella sedge
Distichlis spicata	saltgrass
Eleocharis macrostachya	spike rush
Equisetum spp.	scouring-rushes
Juncus lesueurii	salt rush
Juncus phaeocephalus	brown-headed rush
Lythrum hyssopifolia	loosestrife
Plantago major	plantain
Rumex crispus	curly dock
Scirpus spp.	bulrushes
Solidago spp.	goldenrods

Regional Wildlife

From the perspective of wildlife the coastal dune slack community generally has the species composition of the adjoining habitats, except when the dune slack habitat patch is large, in which case the wildlife composition is similar to that of riparian ecosystems. In the vicinity of the MBPP, the wildlife community of dune slack patches is essentially the same as the wildlife of the coastal dune scrub. Wildlife species associated with riparian ecosystems are found along the southern boundary of Morro Bay High School adjacent to the north side of Atascadero Road. A similar situation is found west of the new Cloisters development north of the high school, except that here there is a noticeable intergrade with dune scrub wildlife species.

Vegetation on Morro Bay Power Plant Site

There are no dune slack communities within the MBPP. However, there are some small patches of *Salix lasiolepis* (arroyo willows) and associated species such as *Baccharis pilularis* (coyote bush) in some of the small wet areas on the MBPP around leaky water pipes where a relatively near permanent supply of water in the sandy soil occurs. These areas would not meet the Corps, CCC, CDFG or City criteria for wetlands due to the lack of hydric soils and lack of wetland hydrology.

Wildlife on Morro Bay Power Plant Site

The small wet areas on site (dominated by arroyo willows) support small numbers of Pacific chorus frogs.

6.6B.1.4.4 Coastal Valley Grasslands

Regional Vegetation

Coastal valley grasslands are areas in which the dominant plants are various species of native and introduced grasses. Often there are numerous other types of herbaceous plants and occasionally scattered shrubs. The grasses that dominate a grassland area may be annuals, perennials or a mixture of the two depending on location and environmental conditions. Over most of the Coast Ranges the grasslands are composed largely of introduced grasses and forbs although many native herbs are also common.

Grasslands on and within a one-mile radius of MBPP occur on relatively flat valleys as well as rolling to steep hillsides that have fine textured, clay rich soils. They integrate with coastal live oak woodlands on more mesic slopes, with coastal scrub on xeric, steep, rocky slopes, and with riparian communities in aquatic and semi-aquatic areas along drainages. Many of the grassland species also occur as understory vegetation of the other communities. Grasslands are the dominant plant cover over some of the hillsides in the Santa Lucia Range northeast of MBPP. Grasslands also occur on some of the hillsides and open areas on and immediately adjacent to MBPP.

The perennial, native bunch grasses, which dominated California grasslands prior to Spanish settlement, have gradually been reduced in distribution locally; however, there are some California native grasslands on the hillsides in portions of the Santa Lucias. Historically, the changes in the composition of grasslands are mostly due to introduction and invasion of alien plant species and changes in the kinds of animals (especially grazing livestock) and their grazing patterns.

Historically, a mixture of mostly perennial grasses and forbs (non-grassy herbs) likely dominated the original, native grassland vegetation around Morro Bay. These grasslands occur on soils that in winter form heavy, sticky clay that dries to nearly the hardness of pavement in the dry summer. The dominant perennial grasses of these areas were probably *Nassella pulchra* (purple needlegrass), *Nassella lepida* (slender needlegrass), *Danthonia californica* (California oat grass), and *Elymus glaucus* (wild blue-rye), and *Melica* spp. (melic grasses). Associated with these perennial grasses were a mixture of annual and perennial forbs. Other native grasses found near Morro Bay include:

Hordeum brachyantherum	native barley
Leymus triticoides	beardless wild-rye
Melica californica	California melic grasses
Melica imperfecta	melic grass
Mulhlenbergia rigens	deer grass

The grasslands that have been heavily grazed or have suffered other forms of disturbances such as filling and grading are composed mostly of introduced annual grasses and forbs. Common species include those listed below:

Introduced Grasses:

Avena barbata	slender wild oats
Avena fatua	common wild oats
Brachypodium distachyon	false brome grass
Bromus diandrus	ripgut brome grass
Bromus hordeaceus	soft chess brome grass
Bromus madritensis var. rubens	red brome
Hardeum marinum	foxtail barley
Lolium multiflorum	annual ryegrass
Vulpia myuros	rattail fescue

Common Associated Weedy Forbs:

Anagallis arvensis	scarlet pimpernel
Brassica nigra	wild mustard
Carduus pycnocephalus	Italian thistle
Erodium botrys	storkbill filaree
Erodium spp.	filaree
Hirschfeldia incana	perennial mustard
Hypochaeris glabra	smooth cat's ear
Hypochaeris radicata	rough cat's ear
Lactuca saligna	slender lettuce
Lactuca serriola	prickly lettuce
Picris echioides	bristly ox-tongue
Plantago lanceolata	English plantain
Rumex conglomeratus	knotted dock

Rumex spp.	docks
Silene gallica	windmill pink
Sonchus spp.	sow-thistles
Vicia sativa	vetch

Common Native Herbs:

Achillea millefolium	yarrow
Chlorogalum pomeridianum	soap plant
Eschscholzia californica	California poppy
Gnaphalium luteoalbum	cudweed
Gnaphalium purpureum	cudweed
Hemizonia congesta ssp. Luzulifolia	hayfield tarweed
Hemizonia spp.	tarplants
Lupinus spp.	lupines
Madia sativa	coast tarweed
Ranunculus californicus	buttercup
Sisyrinchium bellum	blue-eyed grass

Scattered throughout the urbanized portion of the Morro Bay area within one mile of the MBPP are vacant lots and fields in which grasses are the dominant plants. These grassy areas do not represent the original vegetation, but instead are a result of disturbance. Where native vegetation has been cleared, grasses are often the invaders on the disturbed sand. These include many of the annuals listed above, as well as a particularly invasive alien perennial species, *Ehrharta calycina* (veldt grass), on the sandy soils. The removal of the native shrubs begins a process of natural succession that starts with the invasion of weedy colonizing species and that ultimately may result in the regrowth of the shrubby vegetation. This succession from weedy grasses to shrubs may be interrupted at any stage by further human disturbance of the community. This type of succession is occurring in the northeastern and eastern portions of MBPP including the hillsides and the borrow area.

Regional Wildlife

Southern coastal grassland provides foraging areas and habitat for a large number of vertebrate species. For example, several species forage in the grassland, such as western meadowlark, western kingbirds, sparrows, and finches. Raptors such as the northern harrier, red-tailed hawk, American kestrel, common barn owl and burrowing owls hunt in the grassland areas. Raptors may also use the adjacent oak woodlands as sites to observe prey in the grasslands. Some amphibians and reptiles, such as Pacific chorus frogs, western fence lizard, Southern alligator lizard, common kingsnake and gopher snake also hunt in the grasslands. California ground squirrel, Botta's pocket gopher, western harvest mouse, and California voles feed on grassland plants, and coyote and long-tailed weasel prey upon them. Badger burrows are common, as are ground squirrel burrows, both of which open up a subterranean habitat. Mule deer forage in the grasslands while bobcats and mountain lions prey upon the deer, jack rabbits, cottontail rabbits, and brush rabbits.

Some of the most common species are listed below:

- Turkey vulture
- Red-tailed hawk
- American kestrel
- California quail
- Loggerhead shrike
- Black phoebe
- Cliff swallow
- Barn swallow
- American crow
- Western bluebird
- California towhee
- Savannah sparrow
- White-crowned sparrow
- Dark-eyed junco
- Brewer's blackbird
- Western meadowlark
- Western fence lizard
- Western vole
- Botta's pocket gopher
- Desert cottontail
- Jackrabbit
- Coyote
- Mule deer

Vegetation on Morro Bay Power Plant Site

Patches of southern valley grasslands occur on the hillsides in the northeastern corner of the site around standpipes and the borrow area where it intergrades with coastal scrub and the tree plantations along Highway 1. There are a few of the native grasses scattered in the area, but most of the area is composed of the introduced species listed above. There are also grassland areas within one mile of the power plant. Discussion of these grasslands is included in the discussion above.

Wildlife on Morro Bay Power Plant Site

The patch of habitat identified above is the only area at the MBPP where grassland species were observed. No species of concern were observed. Runways from rabbits and rodents were abundant. Pocket gophers and meadow voles were apparent from carcasses, owl pellets and diggings. All owl pellets were observed below large trees adjacent to the grassy area. There was also evidence of skunk activity in this area. A badger burrow was identified adjacent to the grassland. Burrowing owls were not evident in this area. The known owl burrow is located in the opposite corner of the property.

6.6B.1.4.5 Coastal Scrub

Regional Vegetation

This community is dominated by small to medium sized (3 to 6 feet tall) shrubs with a herbaceous understory. Both the density and the composition of the shrub cover vary from site to site, as does the herbaceous understory. In some places, the shrubs form a dense, almost impenetrable woody plant cover with a sparse understory, while in other places the shrubby overstory is more open and has a well-developed herbaceous understory. Most of the dominant shrubs in this plant community are comparatively soft-stemmed plants that undergo significant dieback during the summer drought. For this reason, coastal scrub is sometimes referred to as "soft chaparral" as opposed to the "hard chaparral" or "true chaparral".

Within one mile of MBPP, there are patches of coastal scrub on the rocky slopes of Morro Rock and slopes of the Santa Lucia Range just east of Highway 1 along Little Morro Creek Road. In both areas, it integrates and forms a mosaic with the grassland. Coastal scrub species also extend into the riparian areas along Morro Creek and Little Morro Creek where they form part of the understory vegetation. Coastal scrub species also occur along the riprapped banks of Morro Bay in several areas.

The coastal scrub on the hillsides along Little Morro Creek varies significantly in density due to slope exposure. On the north-facing slope it forms a dense thicket. On the ridge top and south facing slopes it forms a more open shrubland. Some of the mesic sites are completely dominated by poison oak, while others have a few scattered coast live oaks mixed with shrubs. Clearly some of the hillsides along Little Morro Creek have been subject to type conversion, where coastal scrub has been removed and the area converted to grassland.

The relative species composition of the coastal scrub stands varies from site to site. The most common species of the coastal scrub communities are listed below:

Artemisia californica	California sagebrush
Baccharis pilularis	coyote bush
Eriophyllum confertiflorum	golden-yarrow
Eriophyllum staechadifolium	coastal golden-yarrow
Galium porrigens	climbing bedstraw
Hazardia squarrosa	saw-toothed goldenbush
Heteromeles arbutifolia	toyon
Lonicera hispidula	honeysuckle
Lotus scoparius	deerweed
Mimulus aurantiacus	bush monkeyflower
Rhamnus californica	coffee-berry
Rhamnus crocea	redberry
Salvia mellifera	black sage
Sambucus mexicana	elderberry
Toxicodendron diversilobum	poison-oak

Composition and density of the understory in the coastal scrub varies considerably from place to place. In areas where the shrubs form a dense, closed canopy, the understory is usually sparse and poorly developed except in the wetland areas. In areas where the shrubby overstory is open, a fairly well-developed herbaceous understory may be present. Understory species include those also common to the adjacent grasslands as discussed previously. The native bunch grasses discussed in the grassland section are common in some of the open coastal scrub stands on the hillsides.

Within the coastal scrub there are often exposed rock outcrops that support a different species composition than the surrounding coastal scrub. Rock outcrops provide specialized habitats for both plants and animals. Some species are restricted to the rock crevices or to the bare, dry rock surfaces. Rock outcrops are mostly sparsely vegetated by extremely drought tolerant species on their surfaces and by moisture requiring species in their crevices. The hillsides in the Santa Lucia Range near Morro Bay, including areas with one-mile of the MBPP, have a large number of rock outcrops that support drought tolerant herbs and shrubs such as *Artemisia californica* (California sagebrush), *Epilobium canum* (California fuchsia), *Hazardia squarrosa* (saw-toothed goldenbush), *Calystegia macrostegia* (morning-glory), *Chlorogalum pomeridianum* (soap plant), *Dichelostemma pulchellum* (blue dicks), *Salvia columbariae* (Chia), *Phacelia distans* (phacelia) and *Astragalus curtipes* (locoweed) along with species from adjacent grassland areas. Native bunch grasses are also common around some of the rock outcrops, especially the needlegrasses, *Nassella pulchra* and *Nassella lepida*. Morro Rock is also a mosaic of patches of coastal scrub, grassland, and rock outcrop vegetation. The species that occur on Morro Rock include those listed above.

In addition, some unusual plant species, many of which are listed as rare and/or endangered, occur in association with rock outcrops. This is especially true of serpentinite rock outcrops found east of Morro Bay in the Santa Lucia Range including the hillsides just east of Highway 1, which fall within a one-mile radius of MBPP. Serpentine is a metamorphic, magnesium silicate rock, often green in color and slippery to the touch. Serpentine and the soils derived from it have a number of traits. It is low in some essential nutrients, especially calcium, and high in magnesium. In addition, it is often high in toxic elements such as nickel and chromium. As a result of these unusual conditions, serpentine rock and soil support unusual, endemic floras including a large number of rare and endangered species. These include such species as *Calochortus obispoensis* (San Luis Obispo mariposa lily), *Chorizanthe palmeri* (Palmer's spineflower), *Chorizanthe breweri* (Brewer's spineflower), *Calochortus clavatus var. clavatus* (club-haired mariposa lily), *Perideridia gairdneri subsp. gairdneri* (Gairdner's yampah), *Dudleya abramsii ssp. murina* (San Luis Obispo dudleya), *Layia jonesii* (Jones' layia), *Dudleya blochmaniae* (Blochman's dudleya), and *Calystegia subacaulis ssp. episcopalis* (San Luis dwarf morning glory). Several of these have been documented from the hillsides within one-mile east of MBPP; others have not but could still occur.

Regional Wildlife

Coastal scrub vegetation provides excellent cover and foraging opportunities for a wide variety of birds, reptiles, and mammals. Sticky monkeyflower provides abundant nectar resources for hummingbirds, and dense shrubs provide protection for small mammals and birds. Barren soil in patches among the shrubs indicates rodent consumption of small herbs and grasses as well as an allelopathic effect of the leaf litter. Insects rising from flowers and vegetative material in the chaparral provide excellent food for insectivorous birds. On rock outcrops of large size, such as Morro rock, cavity and perch nesting birds can be found. Peregrine falcons breed regularly on Morro Rock. They feed on birds from the estuarine and upland communities. Wildlife species around rock outcrops would include those listed for the grassland and coastal scrub communities.

Some common wildlife species of the coastal scrub and chaparral are listed below:

Red-tailed hawk
American kestrel
California quail
Mourning dove
Allen's hummingbird
Anna's hummingbird
Cliff swallow
Barn swallow
Western scrubjay
Western bluebird
Northern mockingbird
California towhee
White-crowned sparrow
Dark-eyed junco
Brewer's blackbird
Western fence lizard
Southern alligator lizard
Gopher snake
Broad-banded mole
Dusky-footed wood rat
Brush rabbit
Botta's pocket gopher
Coyote
Western gray squirrel

Mule deer

Vegetation on Morro Bay Power Plant Site

There are small, open patches of disturbed coastal scrub in scattered locations over the MBPP site. Most of these patches occur in weedy or grassland areas on the site. *Baccharis pilularis* (coyote bush) is the most common shrub in many of these small patches largely because it is invasive on disturbed areas. However, the patches of coastal scrub on the hillside in the northeastern and eastern portions of the site (near standpipe and the borrow area) have other species such as those listed below.

Artemisia californica	California sagebrush
Baccharis pilularis	coyote bush
Eriophyllum confertiflorum	golden-yarrow
Eriophyllum staechadifolium	coastal golden-yarrow
Hazardia squarrosa	saw-toothed goldenbush
Rhamnus californica	coffee-berry
Toxicodendron diversilobum	poison-oak

There are patches of coastal scrub on the hillsides east of Highway 1 that fall within the one-mile radius of the power plant. The discussion under regional vegetation addresses these areas.

Wildlife on Morro Bay Power Plant Site

In terms of the wildlife, this plant association does not provide a distinct community. The only species found here, that were not observed elsewhere, include: California towhee, Western fence lizard, and Western scrub jay. These species could have been observed at multiple other sites, as were the other species found in the patch.

6.6B.1.4.6 Coastal Salt Marshes and Tidal Mudflats

Regional Vegetation

The zonation of the vegetation around Morro Bay is a result of tidal action and sedimentation of Morro Bay. The estuarine, tidal mudflats and coastal salt marsh communities dominate the bay itself. The estuarine community occurs where the tidal action is such that the area is almost always covered by seawater. In areas around the fringe of the bay where the clay soils of the mudflats have become elevated, the coastal salt marsh develops. This habitat fluctuates from being inundated by tidal action to being completely exposed and has reached an equilibrium with the mean tide. The salt marsh plants that grow here are adapted to these unusual environmental conditions. Tidal mudflats with no vegetation are areas that are generally only exposed at very low tides and never exposed long enough for salt marsh plants to become established. Around the elevated fringe of the mudflats coastal salt marsh develops, and where there is freshwater inflow and minimal tidal influence, there is a zonation from freshwater marsh to riparian woodland along an elevational moisture gradient.

Salt marshes form where there is a mixing of fresh and salt water in a protected embayment with shallow water. Tidal flushing of the bay, which periodically floods the salt marsh, provides the salt water. Fresh water in the Morro Bay Salt Marsh comes from freshwater streams that empty into the bay (primarily Los Osos Creek and Chorro Creek) and from shallow freshwater aquifers that drain off the land as seepage or springs (e.g., Sweet Springs). The mixing of fresh water and salt water forms brackish water of varying degrees of salinity.

The largest area of salt marsh occurs in the central and southern portions of Morro Bay around the estuary of Los Osos Creek south of Turri Road, on both sides of South Bay Boulevard. The largest area of salt marsh occurs in the central and southern portions of Morro Bay around the estuary of Los Osos Creek south of Turri Road on both sides of South Bay Boulevard. However, there are areas of coastal salt marsh within one mile of MBPP. For example, small pockets of coastal salt marsh occur in small coves on the leeward side of the Morro Bay Sand Spit in sediments that border the mudflats and deeper water of the bay. More extensive areas occur on the delta of Chorro Creek in the North Morro Bay area as well. Locally significant areas of salt marsh occur in other areas of Morro Bay and narrow fringes of salt marsh borders the margins of Morro Bay extending to the Shark Inlet.

The plants that live in a salt marsh must be tolerant of a very harsh environment. They may be exposed alternately to fresh water and to water so salty that it would kill most plants. They must be able to tolerate being submerged at high tide and must be able to grow as land plants at low tide. They must be firmly anchored against the ebb and flow of the tides and periodic winter storm floods. Their roots must be able to grow in soil with little or no available oxygen. They must tolerate burial as mud or sand particles are washed into the vegetation by the water. Strong winds sweep across the salt marsh carrying salt spray and bending the leaves and branches of the plants. On sunny days during the summer the salt marsh plants may be exposed to high temperatures.

Because of these harsh environmental conditions relatively few plants can grow in salt marshes. The salt marshes of the Morro Bay are communities of low species diversity, often composed of only a few specialized kinds of plants. The dominant plants are listed below:

Distichlis spicata	Saltgrass
Frankenia salina	Frankenia
Jaumea carnosa	Fleshy jaumea
Limonium commune	sea lavender
Salicornia virginica	Pickleweed
Suaeda californica	California seablite
Triglochin concinna	Arrowgrass

The most salt-tolerant of these species are *Salicornia virginica* and *Suaeda californica*. These two species often grow immediately adjacent to the tidal mudflats where they are frequently inundated at high tides. The other species are slightly less salt-tolerant and occur in areas that are less frequently inundated. The vegetation consists of a tangle of low-growing perennial herbs and succulent low shrubs that are mostly less than 40 cm tall.

Two rare plants occur in the salt marsh: *Cordylanthus maritimus* ssp. *maritimus* (Salt marsh bird's-beak) and *Suaeda californica* (California seablite). No known populations of either species have been reported from areas within one-mile of MBPP, but it is possible that California seablite may occur in these areas.

Regional Wildlife

The City of Morro Bay designated itself as a bird sanctuary. The bay is part of the National Estuary Program, in large part because of its extensive marshlands and tidal flats that it supports. The bay is also part of a larger western North America bird migratory route known as the Pacific flyway. Almost all species of birds that fly along coastal California during migration stop for variable lengths of time and rest or feed in the salt marshes and tidal flats of the bay. This resource has risen in importance with the continued destruction, modification or drainage of other tidal marshes along the Pacific flyway. Many species that occur in Morro Bay occur there only because of the salt marshes. One example is the muskrat. Below is a list of species that occur in the salt marsh and tidal flats:

Red-throated loon	White pelican	Snow goose
Long-billed curlew	Willet	Ring-billed gull
Common loon	Double-crested cormorant	Brant
Marbled godwit	Common snipe	California gull
Horned grebe	Great blue heron	Green-winged teal
Red knot	Caspian tern	Western gull
Pied-billed grebe	Green heron	Cinnamon teal
Dunlin	Royal tern	Bonaparte's gull

Eared grebe	Black-crowned night heron	Mallard
Short-billed dowitcher	Elegant tern	Herring gull
Western grebe	American bittern	Northern pintail
Long-billed dowitcher	Forster's tern	Glaucous-winged gull
Sanderling	Canada goose	Northern shoveler
Clark's grebe	California least tern	Belted kingfisher
California brown pelican	Greater white-fronted goose	Gadwall
Western snowy plover	Marbled murrelet	Pacific-slope flycatcher
American wigeon	Red-breasted merganser	American coo
Say's phoebe	Marsh wren	Brown-headed cowbird
Eurasian wigeon	Ruddy duck	Black-bellie plover
Black phoebe	White-crowned sparrow	Virginia possum
Canvasback	Osprey	Semipalmated plover
Loggerhead shrike	Golden-crowned sparrow	Western harvest mouse
Greater scaup	Northern harrier	Killdeer
Bank swallow	Swamp sparrow	House mouse
Lesser scaup	Peregrine falcon (breeding)	Black-necked stilt
Tree swallow	Song sparrow	Raccoon
Surf scoter	California black rail	American avocet
Violet-green swallow	Dark-eyed junco	Southern sea otter
Common goldeneye	Virginia rail	Greater yellowlegs
Northern rough-winged swallow	Red-winged blackbird	Lesser yellowlegs
Bufflehead	Sora	Spotted Sandpiper
Cliff swallow	Brewer's blackbird	Whimbrel

Several listed species on this list occur regionally, such as California brown pelican, Cooper's hawk, peregrine falcon, California black rail, western snowy plover, California least tern, and the southern sea otter. These are discussed below in Section 6.6B.1.6.

<u>Vegetation on Morro Bay Power Plant Site</u>

There are no coastal salt marshes or tidal mudflats located on or immediately adjacent to the MBPP. However, these communities are very common around the fringe of Morro Bay and do occur within one-mile of the power plant.

Wildlife on Morro Bay Power Plant Site

Coastal salt marsh wildlife is not present on site or immediately adjoining the MBPP.

6.6B.1.4.7 Riparian Woodlands

Regional Vegetation

Waterways such as drainage channels, creeks, streams, lakes, and marshes often support communities of hydrophytic trees, shrubs and herbs. These communities form narrow to locally broad corridors of dense woodland vegetation. The lateral extent of the woodland depends on the size and nature of the creek banks, the amount of water carried and the depth and lateral extent of the subterranean aquifers. Many of the plant species found in riparian habitats are restricted to the flood plain, banks of streams, drainage channels, and other areas where they have access to a shallow water table. Because of California's summer drought, these species are restricted to streamside, lakeside and marshside areas where water is always available. Most of the trees and shrubs of the riparian corridors are winter deciduous plants that require a permanent water supply. However, patches of riparian woodland can also occur in depressions where the water table is shallow such as dune slacks discussed previously and a few small sites on the MBPP site.

Several creeks and drainages in the general vicinity of the MBPP that support various forms of riparian vegetation ranging from broad corridors of dense riparian forests to small corridors of mostly aquatic and semiaquatic shrubs and herbs. Willows mostly dominate riparian communities in the Morro Bay area. *Salix lasiolepis* (arroyo willow) is an abundant species that grows both as a tree and as a shrub. It reproduces both by seed and by underground rhizomes that enable it to spread vegetatively and form dense thickets. Some of the smaller patches of riparian woodland consist almost entirely of this species. *Salix sitchensis* (velvet willow) and *Salix laevigata* (red willow) are also scattered in these riparian areas. Several other riparian trees also occur in the local riparian woodlands but are usually not dominant. These include species such as *Populus balsamifera ssp. trichocarpa* (black cottonwood), *Platanus racemosa* (sycamore) or *Myrica californica* (wax myrtle). *Quercus agrifolia* (coast live oak) and *Umbellularia californica* (California bay laurel) sometimes grows in the drier fringes of the riparian woodlands. *Eucalyptus globulus* (blue gum), an introduced species from Australia, is widely planted in the Morro Bay area and has become established in some riparian areas, as have two commonly planted California natives, *Pinus radiata* (Monterey pine) and *Cupressus macrocarpa* (Monterey cypress).

Vegetation Adjacent to Morro Bay Power Plant Site

Three creeks occur immediately adjacent and within a one-mile radius of the MBPP. Because the creeks are immediately adjacent to the fence line of the site in some places or traverse the site (Willow Camp Creek), the entire creek system adjacent to the MBPP is considered together in this discussion. Morro Creek traverses the northwestern portion of the site. Willow Camp Creek flows westward into Morro Creek near the north end of the Tank Farm.

East of Highway 1 and of the Silver City Mobile Home Manor, Little Morro Creek and Morro Creek are lined by a corridor of riparian woodland dominated by willows. Both creeks traverse agricultural lands northeast of MBPP and of Highway 1. Row crops are planted along and between the two creeks and abut the corridor of riparian woodlands that line the creek banks. Various crops, primarily corn, beans, and dry land crops, are produced in this valley.

Little Morro Creek and Morro Creek join near the eastern end of Silver City Mobile Home Manor and roughly run parallel to and along the south side of Silver City Mobile Home Manor. The southern banks of Morro Creek and both banks of Little Morro Creek are relatively undisturbed except for the natural cutting of the banks by the creek flow. The south side of Morro Creek has been modified by the addition of riprap along most of the portion that is adjacent to the mobile home manor, although there is a small section without riprap near the confluence of Morro and Little Morro Creeks. The banks on both sides of Morro Creek are steep and drop abruptly into the gravelly to sandy creek channel. Except for a few wetland species along the toe of the southern bank, the creek channel in this area was unvegetated by vascular plants. However, invasive herbaceous plants have established along the channel during low flow periods and are washed away during the heavy winter storms.

Morro Creek continues under Highway 1 where its riparian woodland is bordered by Lila Keiser Park on its northern side and by a relatively undisturbed, dense woodland on its southern side next to MBPP. As Morro Creek continues to flow toward the ocean, it parallels the northwestern portion of the MBPP site and is joined by Willow Camp Creek near the northwestern corner of MBPP near Tank 5. Willow Camp Creek parallels a portion of Highway 1 and the northern boundary of MBPP before emptying into Morro Creek. The vegetation along Willow Camp Creek is composed of dense woodland comprised of willows and various planted trees such as blue gum, Monterey pines, and Monterey cypresses near the Highway 1/Main Street interchange. As it continues along the northern boundary of MBPP, the channel is narrow and is composed of a mixture of shrubs and herbs with no trees. Near the confluence of Willow Camp Creek and Morro Creek, there is a very broad flood plain with a dense riparian woodland of mostly willows with a few planted ornamental and native trees.

After the Willow Camp Creek and Morro Creek confluence, Morro Creek continues along the border of MBPP and the Fisherman's Storage Yard to the ocean. It empties into the ocean at the southern end of Atascadero State Beach north of Morro Rock. This section of the creek has also been disturbed and portions of the bank have riprap. The vegetation consists of dense to scattered willows upstream but has little to no tree cover near the southwestern corner of MBPP and the Fisherman's Storage Yard.

Overall, the relatively undisturbed banks of Morro Creek are lined by a dense thicket of almost pure stands of *Salix lasiolepis* (arroyo willow), but *Salix sitchensis* (velvet willow) and *Salix laevigata* (red willow) are also present along Morro Creek. *Platanus racemosa* (sycamore), *Populus balsamifera var. trichocarpa* (black cottonwood) and *Sambucus mexicana* (elderberry) occur scattered along the creek but are uncommon. There is, for the most part, a very dense understory of shrubs and herbs.

Small patches of arroyo willows also occur at the base of Morro Rock where there are seeps and springs that provide a permanent source of water for these trees.

Common shrubs and herbs of the riparian woodland and creek channels include:

Shrubs

Artemisia douglasii	Mugwort
Baccharis pilularis	coyote bush
Baccharis douglasii	marsh Baccharis
Baccharis salicifolia	mule fat
Clematis ligusticifolia	virgin's bower
Cornus stolonifera	red osier dogwood
Heteromeles arbutifolia	Toyon
Lonicera hispidula	Honeysuckle
Rhamnus californica	Coffeeberry
Rubus ursinus	California blackberry
Salix lasiolepis	arroyo willow
Sambucus mexicana	Elderberry
Symphoricarpos mollis	Snowberry
Toxicodendron diversilobum	poison-oak

Herbs:

Agrostis viridis	water bentgrass
Artemisia douglasiana	Mugwort
Carex senta	Sedge
Carex subfusca	Sedge
Conium maculatum	poison hemlock
Cyperus eragrostis	umbrella sedge
Eleocharis macrostachya	spike-rush
Epilobium watsonii	willow herb
Equisetum telmateia	giant horsetail
Foeniculum vulgare	Fennel
Juncus bufonius	toad rush

Juncus effusus	Rush
Juncus patens	spreading rush
Juncus phaeocephalus	brown-headed rush
Lythrum hyssopifolia	Loosestrife
Phalaris aquatica	harding grass
Polypogon interruptus	interrupted polypogon
Polypogon monspeliensis	rabbitfoot grass
Rorippa nasturtium-	aquaticum watercress
Rumex spp.	Docks
Scirpus americanus	olney's three-square bulrush
Scirpus pungens	common three-square bulrush
Senecio mikanioides	German-ivy
Urtica dioica ssp. Holosericea	stinging nettle
Veronica anagallis-aquatica	Speedwell

In addition to these, some of the herbs common in the adjacent grassland mix with the riparian species in drier areas along the drainage. It should be noted that *Senecio mikanioides* (German-ivy) is a noxious weed that comes in after disturbance, and although it is a very difficult weed to control, eradication efforts should be attempted. Common garden escapes such as *Zantedeschia aethiopica* (Calla lily) and *Tropaeolum majus* (Nasturtium) have also become part of riparian vegetation in this area.

The creek channel itself is unvegetated in areas that have rocky and gravelly bars with little or no soil. These areas have no vegetation because of the substrate and because floodwaters during the rainy season wash everything away. However, tough-rooted or rhizomatous herbs such as *Cyperus eragrostis* (umbrella sedge), *Carex spp.* (sedges), and *Juncus spp.* (rushes) can become firmly anchored in the stream sediments in some sections of the creek. A few willow seedlings and saplings were also noted.

The creek channel is generally flushed of vegetation during the winter/spring storms. Subsequently a sparse to locally dense temporary vegetation develops on the sand and gravel bars along the creek and along the slowly flowing stream of the main channel. Species such as *Rorippa nasturtium-aquaticum* (watercress), *Polypogon spp.* (rabbitfoot grass), and *Carex spp.* (sedges) are found in the creek channel. The plants characteristic of riparian environments are joined by some species common to the surrounding plant communities and, in some places, by a sparse growth of plants whose seeds were washed into the creek gravel by winter storms and germinated in the riparian area. These include a mixture of introduced weeds and native species more characteristic of non-riparian vegetation. Most of the plants of the stream channel are washed out by the winter floods that scour the channel nearly free of vegetation.

Much of the riparian vegetation has been lost along the northern bank of Morro Creek in Silver City Mobile Home Manor and along both banks where it empties onto Atascadero State Beach and into the ocean. There are a few patches of willows in the open areas and a few willow saplings in the riprap; however, other areas are mostly devoid of riparian vegetation.

In some areas of Morro Creek, such as near the mobile home park, the Fisherman's Storage Yard and the RV Park adjacent to Atascadero State Beach, the top of the bank is highly disturbed and is now vegetated by an anthropogenic community. (Anthropogenic communities are those dominated by plants introduced by humans or maintained by human disturbance.) These communities are mostly restricted to areas along the roadside and creek banks where creek bank modification has occurred; however, some of the weeds have invaded adjacent undisturbed riparian woodlands. These past disturbances have created habitat for a wide variety of weedy species such as those listed below.

Anagallis arvensis	Scarlet pimpernel
Anthemis cotula	Stinkweed
Avena barbata	Slender wild oats
Bromus spp.	Brome grasses
Carpobrotus spp.	Ice plants
Chenopodium album	Lamb's quarter
Conium maculatum	Poison hemlock
Erodium spp.	Filarees
Foeniculum vulgare	Fennel
Hirschfeldia incana	Mustard
Lolium perenne	Annual ryegrass
Malva nicaeensis	Mallow
Medicago polymorpha	Bur clover
Melilotus indica	Yellow sweet clover
Picris echioides	Prickly ox-tongue
Plantago lanceolata	English plantain
Polygonum arenastrum	Knotweed
Polypogon monspeliensis	Rabbitfoot grass
Raphanus sativus	Wild radish
Silybum marinum	Milk thistle
Sonchus asper	Prickly sow thistle
Sonchus oleraceus	Common sow thistle

Regional Wildlife

Riparian and freshwater marshes support a diversity of wildlife species. These are complex habitats that provide water and moist areas in an otherwise relatively dry hillside area. The variety of vertical habitats in the trees, shrubs and herbs provide nesting and foraging sites for a wide variety of vertebrate species.

These habitats are critical for many wildlife species because they provide a rather permanent source of water and moist microhabitats. Common wildlife species of riparian and freshwater marsh areas include:

- Central California Coast Steelhead Trout
- Ensatina
- California slender salamander
- Black-bellied slender salamander
- Pacific slender salamander
- Arboreal salamander
- Coast Range newt
- Western toad
- California red-legged frog
- Pacific chorus frog
- Green heron
- Black-crowned night heron
- American bittern
- Green-winged teal
- Cinnamon teal
- Mallard
- Canvasback
- Common goldeneye
- Bufflehead
- White-tailed kite
- Cooper's hawk
- Sharp-shinned hawk
- Red-shouldered hawk
- Western scrubjay
- Chestnut-backed chickadee
- Bushtit
- White-breasted nuthatch
- Bewick's wren
- Marsh wren
- Ruby-crowned kinglet
- Hermit thrush
- Swainson's thrush
- American robin
- European starling
- Hutton's vireo
- Warbling vireo
- Orange-crowned warbler
- Yellow warbler
- Yellow-rumped warbler
- Townsend's warbler
- Palm warbler
- Common yellowthroat
- Swamp sparrow
- Song sparrow
- Red-winged blackbird
- Brewer's blackbird

Red-tailed hawk
American kestrel
Killdeer
Western snowy plover
Willet
Common snipe
Ring-billed gull
California gull
Western gull
Bonaparte's gull
Herring gull
Glaucous-winged gull
Mourning dove
Western screech-owl
Vaux's swift
White-throated swift
Anna's hummingbird
Rufous hummingbird
Allen's hummingbird
Belted kingfisher
Say's phoebe
Black phoebe
Willow flycatcher
Bank swallow
Tree swallow
Violet-green swallow
Northern rough-winged swallow
Cliff swallow
Brown-headed cowbird
Hooded oriole
Bullock's oriole
Purple finch
American goldfinch
Lesser goldfinch
House finch
House sparrow
Virginia opossum
Ornate shrew
Trowbridge's shrew'
Broad-footed mole
Myotis bats
Hoary bat
Pallid bat
Mexican free-tailed bat
Western harvest mouse
California mouse
Deer mouse
Brush mouse
Monterey dusky-footed woodrat
House mouse
Coyote
Grey fox
Red fox
Longtailed weasel
Raccoon

The enormous species diversity is in part a characteristic of riparian habitats, and is also a function of the fact that this particular creek system extends out into the coastal strand. The diversity is augmented by the proximity of various other habitat types, and by low density populations that may be due to one or just a few individuals (such as for the palm warbler).

Most of the vertebrates require a reliable source of water. Mobile species easily access pooled water. Other species may depend on fog drip, dew drops, and moisture contained in vegetation. It is important to note that the relative humidity in the vicinity of the marshes and along the riparian corridor is higher than in surrounding grasslands, forest, and coastal scrub communities. Soil moisture persists through the summer drought season, plant moisture levels are higher than in surrounding communities, and small pools of water provide life-giving moisture to a wide variety of organisms.

Vegetation of Morro Bay Power Plant Site

In addition to the Morro Creek and Willow Camp Creek systems, the dune slacks, and small patches of arroyo willows at the base of Morro Rock that were addressed previously, there are small patches of arroyo willows and associated species within the MBPP and on adjacent properties. These occur around seeps and depressions, or low areas such as stormwater retention basins on the PG&E property, where the water table is shallow resulting in a near permanent supply of water for plant growth. There are also some water leaks which have resulted in arroyo willows or other mesic vegetation forming in sandy depressional areas on the MBPP site. These include an area near Tank 5, near Spill Basin 3, and near Blowdown Tank. Due to the lack of hydric soil conditions and lack of wetland hydrology in these latter areas, they would not be considered as meeting Corps, CCC, CDFG or City wetland criteria due to the lack of wetland hydrology and hydric soil conditions.

Wildlife of Morro Bay Power Plant Site

All of the species listed above are possible on the MBPP site especially along the boundary with the riparian corridor to the north and east. None of these species would be considered abundant on site. This is not necessarily because they are rare within their habitat, but because the habitat is linear and predominately found off site.

6.6B.1.4.8 Freshwater Marshes

Regional Vegetation

Freshwater marshes usually occur in nutrient-rich mineral soils that are saturated through most or all of the year by water. These communities are best developed in locations with slow-moving or stagnant shallow water. Such sites commonly occur around springs and along the margins of ponds or lakes and in the flood plains of slow-moving streams. In areas where freshwater marshes occur there is not always standing water throughout the entire year, but instead, the water table is so close to the soil surface that it can be tapped in the dry season by marsh plants. Aquatic and semi-aquatic perennial herbaceous plants, some of which also occur in the riparian woodland, dominate freshwater marshes.

In the Morro Bay area freshwater marshes occur in association with the various streams and drainages, including Morro Creek and Little Morro Creek. They also occur around various ponds and small lakes and as localized bands along the shore of Morro Bay where water from the area's shallow aquifer emerges as springs or as seepage. In most of these areas the marsh communities are closely associated with riparian woodlands. In the estuary of Chorro and Los Osos Creek, the freshwater marshes grade into the coastal salt marsh.

Freshwater marshes occur within one-mile of the MBPP and include small patches along the Morro and Little Morro Creeks. These small marshes are dominated mostly by a mixture of erect reed-like plants from one to several meters tall and a mixture of lower-growing herbs. The tall dominant plants include: *Typha spp.* (cattails), *Scirpus spp.* (bulrushes, tules), *Carex spp.* (sedges), *Eleocharis spp.* (spike-rushes) and *Juncus spp.* (rushes). Commonly associated with these are species of *Rumex spp.* (docks) and *Polygonum spp.* (smartweeds), *Rorippa nasturtium-aquaticum* (watercress), *Epilobium watsonii* (willow herb), *Oenanthe sarmentosa* (water-parsley), and *Hydrocotyle ranunculoides* (marsh pennywort). Floating on the surface of ponds may be *Lemna minor* (duckweed) and *Azolla filiculoides* (mosquito fern). The composition of a particular freshwater marsh depends on the depth of the water and its permanence, on the presence of nearby trees (and the shade they cast), on whether or not brackish water is present at times, and on the amount of disturbance of the habitat.

<u>Regional Wildlife</u>

Because the freshwater marshes intergrade into saltwater marsh and riparian systems, the same wildlife species occur. The specific wildlife species mix will depend on the extent of the freshwater marsh relative to the other two communities.

<u>Vegetation of Morro Bay Power Plant Site</u>

Patches of freshwater marsh occur only at Morro Creek and Willow Camp Creek as discussed in the previous section. In addition, a small patch of freshwater marsh plants occurs offsite around the PG&E stormwater retention pond along Peregrine Road. Some semi-aquatic species occur on the MBPP in sandy depressions where a near permanent supply of water for plant growth has occurred due to leaky water pipes. These areas on the MBPP would not meet Corps, CCC, CDFG or City criteria for wetlands due to lack of wetland hydrology and lack of hydric soils. These include an area near Tank 5, near Spill Basin 3, and near Blowdown Tank.

<u>Wildlife of Morro Bay Power Plant Site</u>

All of the species listed under saltwater marsh and riparian vegetation are possible on the MBPP site especially along the boundary with the riparian corridor to the north and east. None of them would be considered abundant or even common on site.

6.6B.1.4.9 Plantations and Urban Mix

Regional Vegetation

Within the Morro Bay area there are several areas where ornamental trees have been planted along roads, highways, and lots. Some of these are exotics such *Eucalyptus globulus* (blue gum), *Eucalyptus ficifolia* (scarlet-flowering gum), *Myoporum laetum* (myoporum) and *Pinus halepensis* (Aleppo pine). Others are native to California but not to the Morro Bay such as *Pinus radiata* (Monterey pine) and *Cupressus macrocarpa* (Monterey cypress). In some areas the trees occur as windrows, in other areas they form extensive man-made forest communities, and in other areas they mix with native species and form what is sometimes referred to as an "urban mix". The urban mix is common along Highway 1 and along some of the drainages and creek areas where these planted trees mix with willows and other natives. In some areas, certain of these trees have become naturalized and are reproducing and maintaining themselves successfully.

The most extensive of these man-made forests are composed of large plantings of blue gum. Some of these plantations are characterized by having pure, dense stands of blue gum trees. The trees shade the ground and litter the soil surface with fallen branches, leaves, fruits and bark. Fog-drip and rainwater passing through the leaves and branches carry dissolved chemicals that add to the substances leached from the fallen litter producing a significant allelopathic (growth inhibiting) effect on understory vegetation. The net result is that very few other plant species are able to grow in the blue gum forests. Consequently, the understory is often sparse if present at all. Thus in areas where blue gum trees have been planted, they have virtually completely replaced the native vegetation.

Monterey pines and cypresses, while native to coastal California, are not native to the Morro Bay area. Like the blue gums, these trees have a significant impact on understory vegetation though the allelopathic effect does not seem as pronounced. These trees have also been planted in pure stands in some places but usually occur in mixtures and are often planted with blue gum. The native vegetation has been modified significantly in areas where these trees have been planted.

Eucalyptus ficifolia (scarlet-flowering gum), *Myoporum laetum* (myoporum) and *Pinus halepensis* (Aleppo pine) have not been planted as widely but are important locally along the highways that border Morro Bay and MBPP. Several species of shrubs have also been planted along with the trees and form the "urban mix" type vegetation along the northern boundary of MBPP next to Highway 1. Some of the common planted shrubs include *Leptospermum laevigatum* (Australian tea-tree), and various species of *Acacia spp.* (acacia), and *Melaleuca spp.* (bottlebrush). In other areas, such as along the eastern boundary fence, rows of native shrubs have also been planted. These shrubs are not indigenous to the MBPP area but are native to California. These include *Prunus ilicifolia* (holly leafed cherry), *Ceanothus dentatus* (dentate ceanothus), and *Ceanothus griseus* (Carmel ceanothus).

Regional Wildlife

Plantations can offer significant wildlife habitat. Within the Morro Bay area the most important wildlife use of plantations by wildlife is for nesting by several raptor species (red-shouldered hawks and red-tailed hawks), great horned owls, great blue herons, and double-crested cormorants. Plantations that are comprised principally of pines can be very important habitat for trunk foraging species such as red-breasted nuthatch and brown creepers. Those plantations that are older and contain dead trees or limbs may be extremely important to woodpeckers and a variety of cavity-nesting birds. In general, there are no specialists on plantations since these trees are imported. Rather, birds that use plantations extensively would be found in any wooded area. They generally respond to the presence of trees rather than to the species composition of the tree stand.

Vegetation of Morro Bay Power Plant Site

There are several plantations and windrows on the MBPP site and on the adjacent areas next to Highway 1 and Embarcadero. These plantations and windrows occur mostly along the edges of the main areas of the MBPP and line Highway 1 next to the power plant. The windrows closest to the ocean have been wind pruned by the salt laden ocean winds and are not as tall as those in more protected areas such as in the northeastern portion of MBPP. These trees have also expanded into the riparian areas of both Willow Camp Creek and Morro Creek adjacent to MBPP.

Wildlife of Morro Bay Power Plant Site

The greatest species diversity and animal abundance at the MBPP site was in association with plantings. Monarch butterflies were observed in association with blue gum. Much of the plantings areas was bordered by grassland and appeared to support a healthy population of rodents, including meadow voles and pocket gophers, as well as their predators, including barn owls, great horned owls, skunk, and red fox. It is expected that these areas would also have the highest diversity and density of snakes.

6.6B.1.4.10 Anthropogenic Communities

Regional Vegetation

Communities dominated by plants introduced by man and established or maintained by human disturbance are anthropogenic communities. Some of these are entirely artificial communities such as cultivated row-crops, lawns, vineyards, etc. Others are assemblages of weedy species that have invaded disturbed areas, sometimes in spite of human efforts to control them. Weed-dominated communities often represent the early stages of natural succession. In the absence of disturbance many weedy plants do not persist, but are gradually replaced by native vegetation. Many of man's activities, however, cause continual disturbance. In the Morro Bay area, anthropogenic communities on the Project site can be divided into the two types: agrestal communities and ruderal communities.

The agrestal communities occur in the agricultural fields where cultivation results in repeated disturbance to the soil. Ruderal communities occur along the roadsides where repeated disturbances are caused by vehicles, oil, dust, etc.

Agrestal Communities. Agrestal plant communities are common in cultivated areas in the Morro Bay area such as the agricultural lands between Morro Creek and Little Morro Creek east of Highway 1. Many species of weeds thrive in the same environments as crop plants. These weedy species are able to grow to maturity and to reproduce side by side with crop plants. Because culture practices vary depending on the crop being grown, the weed communities often will vary with the crop.

Some of the agrestal weeds are annuals that are able to complete their life cycles within the same time span as the crop plants. Mechanical harvesting of crops promotes the growth of many of these weedy annuals because the machinery can disseminate their seeds. In addition, many of these annuals have seeds that are long-lived and are able to persist as a buried seed bank in the soil for many years. Other agrestal weeds on the site are perennials with underground rhizomes. Although above ground parts of the plant may be destroyed, the rhizomes are merely fragmented by cultivation and each clone may yield a new plant. Plants such as *Convolvulus arvensis* (field bindweed) and *Centaurea repens* (Russian knapweed) are particularly difficult to eradicate once established.

Ruderal Communities. Roadside plant communities such as those along the roads and highways of Morro Bay are all influenced to some degree by human activities. Only plants capable of withstanding the roadside conditions and disturbances are able to grow in ruderal communities.

Although many of California's native plant species are able to grow on roadsides they often fail to become established because of competition from aggressive Eurasian species. Most successful weeds produce large quantities of seeds and readily invade disturbed sites. Many have features that allow their seeds to be widely dispersed. As a result, many of the species of the ruderal communities along Turri Road have also invaded the adjacent cultivated field and are part of the agrestal communities on the Project site.

Most of the native species encountered also have some weedy tendencies, e.g., *Baccharis pilularis* (coyote bush), *Eremocarpus setigerus* (turkey mullein), *Hemizonia luzulifolia* (hayfield tarweed), *Heterotheca grandiflora* (telegraph weed). Many members of the native flora that could grow on roadsides if given the opportunity, fail to do so because they lack efficient seed dispersal mechanisms.

The following is a list of some of the most common plants in the anthropogenic communities on the Project site.

Amaranthus albus	Amaranth
Anagallis arvensis	Scarlet pimpernel
Anthemis cotula	Mayweed
Brassica nigra	Black mustard

Briza minor	Little quaking grass
Capsella bursa-pastoris	Shepherd's purse
Carduus pycnocephalus	Italian thistle
Centaurea melitensis	Tocolote
Centaurea solstitialis	Yellow star-thistle
Chamomilla suaveolens	Pineapple weed
Cirsium vulgare	Bull thistle
Conium maculatum	Poison hemlock
Convolvulus arvensis	Bindweed
Conyza canadensis	Horseweed
Eremocarpus setigerus	Turkey mullein
Euphorbia peplus	Petty spurge
Foeniculum vulgare	Fennel
Gastridium ventricosum	Nit grass
Heterotheca grandiflora	Telegraph weed
Hirschfeldia incana	Perennial mustard
Lactuca saligna	Slender lettuce
Lactuca serriola	Prickly lettuce
Malva parviflora	Mallow
Medicago polymorpha	Bur-clover
Melilotus indica	Yellow sweet clover
Pennisetum villosum	Fountain grass
Picris echioides	Bristly ox-tongue
Plantago lanceolata	English plantain
Polygonum arenastrum	Knotweed
Raphanus sativus	Wild radish
Silybum marianum	Milk-thistle
Sisymbrium officinale	Hedge mustard
Sonchus asper	Prickly sow-thistle
Sonchus oleraceus	Common sow-thistle
Taraxacum officinale	Dandelion

Regional Wildlife

There are no native wildlife species that are exclusively found in anthropogenic plant communities. There are wildlife species that are associated with such communities and these primarily include grassland species. Grassland species might include: meadow voles, pocket gophers, white-footed mice, brush rabbits, hares, and a diversity of commensal species such as house mice and introduced rats. Also associated with grasslands would be a diversity of seed-eating birds (sparrows, finches, towhees, and juncos), as well as insectivorous and carnivorous predators (shrikes, kingbirds, phoebes, swallows, egrets, owls, hawks, lizards, and snakes). A specific list of possible species includes:

- Turkey vulture
- Red-tailed hawk
- American kestrel
- Loggerhead shrike
- Black phoebe
- Cliff swallow
- Barn swallow
- American crow
- Western bluebird
- California towhee
- Savannah sparrow
- White-crowned sparrow
- Dark-eyed junco
- Brewer's blackbird
- Western meadowlark
- Western fence lizard
- Meadow vole
- Botta's pocket gopher
- Desert cottontail
- Jackrabbit
- Coyote
- Mule deer

Vegetation of Morro Bay Power Plant Site

Most of the MBPP is comprised of highly disturbed habitats and have anthropogenic communities associated with them. Where there are vacant disturbed lands such open fields, along roads, around structures and similar areas, the dominant plants are introduced weeds. All of the plants listed above under ruderal vegetation were found somewhere on the MBPP.

Wildlife of Morro Bay Power Plant Site

Wildlife values are low for these areas, but some of the same wildlife species that use the grassland would also be found in these disturbed sites. Species observed in this plant community include those listed above under grassland and plantation vegetation types.

6.6B.1.4.11 Chaparral

Stiffly branched, leathery-leafed (sclerophyllous) shrubs mostly 1-3 meters tall dominate chaparral communities. These communities are a feature of much of the landscape of southern California. Chaparral is a very broad category and may be composed of a variety of different species. Some of the chaparral communities, such as the maritime chaparral do occur south and east of MBPP, but not within a one-mile radius.

6.6B.1.4.12 Coast Live Oak Woodlands

One of the most characteristic vegetation types of the central coast of California is the oak woodlands. *Quercus agrifolia* (coast live oak) is the dominant tree in the oak woodlands in the Santa Lucia Range along the immediate coast, and it is common in many areas. While some coast live oaks occur within a one-mile radius of MBPP, there are no well-developed coast live oak woodlands within a one-mile radius of the power plant.

6.6B.1.5 SENSITIVE HABITATS

The CNDDB lists six habitats found in the Morro Bay region as sensitive (see Appendix 6.6B-1, Appendix 4). Each is listed below and briefly discussed in relation to their occurrence on the MBPP site (see Figure 6.6B-1). Of the six habitats, two do not occur within a one-mile radius of the MBPP. Impacts to sensitive habitats are discussed in the Impact and Mitigation section below.

Central coastal dune scrub has been described and discussed in detail in this report. In the Morro Bay area, it occurs in the backdunes from Estero Bay to Montaña de Oro State Park, including the Morro Bay Sand Spit. Several sensitive plant and animal species are associated with this community and have been addressed in this report.

Central maritime chaparral does not occur within a one-mile radius of MBPP; however, it is common around the central and southern ends of the Morro Bay Estuary. This community supports several rare species, which are addressed in sections that follow.

Valley needlegrass grassland does not occur within a one-mile radius of MBPP although it is possible it occurs on the hillsides east of Highway 1. While some of the native grasses are known to occur on the hillsides, their presence is so scattered and integrated with the introduced grasslands that they are not included as native grassland habitats.

(Northern) coastal salt marsh is common along the fringe of Morro Bay, and its distribution and features have been discussed in detail in an earlier section.

Coastal brackish marsh is the type of wetland that occurs where freshwater from streams mixes with saltwater in the bay forming an ecotone and mosaic of freshwater and saltwater marshes. These are common at the mouths of some of the creeks that empty into Morro Bay and also around some of the freshwater seeps and springs that occur along the edge of the bay. There is not a development of this type community at the mouth of Morro Creek, which empties into the ocean just north of Morro Rock.

Coastal and valley freshwater marsh habitats are found in areas along some of the creeks and where ponds form in depressions. Some small examples of human-influenced growth of marsh vegetation occur on the MBPP property in depressions with highly permeable sandy soils where there are leaks from fire control pipe valves. These however, would not qualify as Corps, CCC, CDFG or City wetlands due to the lack of hydric soil conditions and lack of wetland hydrology.

In addition to the above list, **riparian woodlands** should also be considered sensitive. Over 90% of the original riparian woodland in California have been destroyed, and many of the remaining ones have been degraded by human activities. Some riparian woodland areas are located near the Project.

6.6B.1.6 RARE AND ENDANGERED PLANTS AND ANIMALS

Special-status species are plants and animals that are either listed as endangered or threatened under the Federal or California Endangered Species Act, considered rare under the California Native Plant Protection Act, or considered rare (but not legally listed) by resources agencies, professional organizations, and the scientific community. For the purposes of this biological resources assessment, special-status species are defined in Table 6.6B-1.

The Federal Endangered Species Act (ESA) of 1973, 16 U.S.C. § 1531 et seq., (50 CFR Part 17) provides legal protection for plant and animal taxa that are listed as threatened or endangered under the ESA. The ESA requires Federal agencies to ensure that all Federal actions, (e.g. permit approvals, funding actions or federal development projects) do not jeopardize the continued existence of any listed species. As interpreted by the U.S. Fish and Wildlife Service, Section 9 of the ESA prohibits the "take" of species listed as threatened or endangered. The National Marine Fisheries Service concurs on endangered species and considers threatened species on a case-by-case basis.

As part of the Terrestrial Biological Survey a review of the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California data base was conducted, and the most recent CDFG Natural Diversity Database for rare or endangered plant species found in the

Morro Bay North and South USGS Quadrangles was obtained (Appendix 6.6B-1, Appendix 4). The CNDDB considers both state and federally listed species. The rare and endangered plants listed below either showed up on the data base search, have been observed by the authors of the Terrestrial Biological Survey, Appendix 6.6B-1 or have been reported from the Morro Bay area by other sources.

Based on survey work and field observations, no rare and/or endangered plants were detected among the plants found on the site, and none would be expected to occur on the site because favorable habitats are not present. However, several species would be expected to occur within a one-mile radius of the power plant. For example, several of the species are serpentine endemics and serpentinite outcrops do occur within one-mile of MBPP.

The Terrestrial Biological Survey concludes that no threatened or endangered wildlife species are known to be on the site of the MBPP. With regard to the Morro shoulderband snail, as discussed below, USFWS protocol surveys for this species indicate that the surveys should be associated with rain events. This is due to the fact that the Morro shoulderband snail is most active after rainfall, and therefore most likely to be detected and also least likely to be impacted by the survey procedure. Due to the fact that the disturbed coastal dune scrub habitat on site was identified as potential habitat for this species after the end of the rainy season, a protocol survey was not conducted. A survey was conducted which was designed to maximize locating this species if it were to be present, given the seasonal constraint, and at the same time eliminate the potential impact of the survey itself on the species, if present. The survey protocol is described below. Surveys for the California legless lizard were therefore constrained by the potential presence of the Morro shoulderband snail. Although neither the Morro shoulderband snail nor the California legless lizard were encountered on site during the surveys, due to the above described constraints, it is the biologist's evaluation that it cannot be ruled out that either of these species may occur on site. Mitigation measures related to both the Morro shoulderband snail and the California legless lizard are discussed below (see Section 6.6B.2).

Only one species of special concern (burrowing owl) is known to occur on site. Several listed species potentially occur on site in low numbers or during brief periods of the year. Many listed species are expected to occur, or are known to occur in habitats adjacent to the MBPP (specifically the coastal scrub to the west and Morro Creek to the north).

Based on information obtained through the CNDDB search, CNDDB List of Special Plants (July 2000), and review of existing literature, a special-status species list was compiled that includes species that have potential to occur in the vicinity of the Project area. Table 6.6B-1 gives the definition of special status plant and animal species. Table 6.6B-2 identifies the name and legal status of special-status species either reported from or expected to occur within one-mile of the site based on the presence of suitable habitat. Table 6.6B-3 identifies the name and legal status of special-status species either reported from the general vicinity of the MBPP or expected to occur in the region (within a 5-mile radius) based on the presence of suitable habitat or because they are listed in the CNNDB. The distribution, preferred habitats, and any known occurrences of various identified special-status species are described after the tables.

Table 6.6B-1 Definitions of Special-Status Species

Special-Status Plant Species
Plants listed or proposed for listing as threatened or endangered under the Federal Endangered Species Act (50 CFR 17.12 for listed plants and various notices in the Federal Register for proposed species).
Plants that are Category 1 candidates for possible future listing as threatened or endangered under the Federal Endangered Species Act (55 CFR 6184, February 21, 1990).
Plants that meet the definitions of rare or endangered species under the CEQA (State CEQA Guidelines, Section 15380).
Plants considered by the CNPS to be "rare, threatened, or endangered" in California (Lists 1B and 2 in Skinner and Pavlik, 1994).
Plants listed by CNPS as plants about which we need more information and plants of limited distribution (Lists 3 and 4 in Skinner and Pavlik, 1994).
Plants listed or proposed for listing by the State of California as threatened or endangered under the California Endangered Species Act (14 CCR 670.5).
Plants listed under the California Native Plant Protection Act (California Fish and Game Code 1900 et seq.).
Plants considered sensitive by other federal agencies (i.e., U.S. Forest Service, Bureau of Land Management), state and local agencies or jurisdictions.
Plants considered sensitive or unique by the scientific community or occurring at the limits of its natural range (State CEQA Guidelines, Appendix G).
Special-Status Wildlife Species
Animals listed or proposed for listing as threatened or endangered under the Federal Endangered Species Act (50 CFR 17.11 for listed animals and various notices in the Federal Register for proposed species).
Animals that are Category 1 candidates for possible future listing as threatened or endangered under the Federal Endangered Species Act (54 CFR 554).
Animals that meet the definitions of rare or endangered species under the CEQA (State CEQA Guidelines, Section 15380).
Animals listed or proposed for listing by the State of California as threatened and endangered under the California Endangered Species Act (14 CCR 670.5).
Animal species of special concern to the CDFG (Remsen, 1978 for birds; Williams, 1986 for mammals).
Animal species that are fully protected in California (California Fish and Game Code, Sections 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]).

Table 6.6B-2. Special-Status Plants and Animals Documented From or Likely to Occur Within A One-Mile Radius of the Morro Bay Power Plant

	Scientific Name	Common Name	Legal Status Federal/State/Other
Plants			
D	*Calochortus clavatus var. clavatus*	Club-haired Mariposa Lily	- / - /CNPS 4
	Calystegia subacaulis ssp. Episcopalis	Cambria morning-glory	SC/ - /CNPS 1B
	Chorizanthe breweri	Brewer's spineflower	- / - /CNPS 1B
D	*Cordylanthus maritimus ssp. Maritimus*	Salt marsh bird's-beak	E/E/CNPS 1B
	Dithyrea maritima	Beach spectacle-pod	SC/T/CNPS 1B
D	*Dudleya abramsii var. bettinae*	San Luis Obispo serpentine dudleya	SC/ - /CNPS 1B
D	*Dudleya blochmaniae ssp. Blochmaniae*	Blochman's Dudleya	SC/ - /CNPS 1B
	Erigeron blochmaniae	Blochman's leafy daisy	- / - /CNPS 1B
D	*Erysimum insulare ssp. Suffrutescens*	Suffrutescent wallflower	- / - /CNPS 4
	Layia jonesii	Jones's layia	SC/ - /CNPS 1B
	Malacothrix incana	Dunedelion	- / - /CNPS 4
D	*Mucronea californica*	California spineflower	- / - / CNPS4
D	*Suaeda californica*	California seablite	E/ - /CNPS 1B
Wildlife			
D	*Oncorhynchus mykiss*	Central California Coast Steelhead Trout	FT
D	*Eucyclogobius newberryi*	Tidewater goby	FE/CSC
D	*Helminthoglypta walkeriana*	Morro shoulderband snail	FE
D	*Icaricia icarioides moroensis*	Morro Bay blue butterfly	FSC
	Taricha torosa	California newt	CSC
D	*Clemmys marmorata pallida*	Southwestern pond turtle	FSC/CSC

	Scientific Name	Common Name	Legal Status Federal/State/Other
Table 6.6B-2 (Continued)			
D	*Rana aurora*	California red-legged frog	FT
	Scaphiopus hammondii	Western spadefoot toad	FSC/CSC
D	*Phrynosoma coronatum*	Horned lizard	FSC/CSC
D	*Anniella pulchra*	California legless lizard	FSC/CSC
D	*Thamnophis hammondii*	Two-striped garter snake	CSC
	Gavia immer (nesting)	Common loon	CSC/MNBMC
D	*Pelecanus occidentalis*	California brown pelican	FE/SE
D	*Phalacrocorax auritus (rookery)*	Double-crested cormorant	CSC
	Ardes herodias (rookery)	Great blue heron	CDFSC
D	*Botaurus lentiginosus*	American bittern	MNBMC
D	*Accipiter cooperi*	Cooper's hawk	FE/ST
D	*Accipiter striatus*	Sharp-shinned hawk	CSC
D	*Circus cyaneus*	Northern harrier	CSC
D	*Elanus caeruleus*	White-tailed kite	*
D	*Aquila chrysaetos*	Golden eagle	CSC
D	*Falco peregrinus (nesting)*	Peregrine falcon	Delisted/SE
	Laterallus jamaicensis	California black rail	FSC/ST
	Rallus longirostris obsoletus	California clapper rail	FE/SE
D	*Charadrius alexandrinus (nesting)*	Western snowy plover	FT/CSC
D	*Sterna antillarum*	California least tern	FE/SE
D	*Brachyramphus marmoratus*	Marbled murrelet	FT/SE
D	*Athene cunicularia*	Burrowing owl	FSC/CSC

	Scientific Name	Common Name	Legal Status Federal/State/Other
Table 6.6B-2 (Continued)			
D	*Empidonax traillii*	Willow flycatcher	SE
D	*Lanius ludovicianus*	Loggerhead shrike	FSC/CSC
D	*Riparia riparia*	Bank swallow	ST
D	*Dendroica petechia*	Yellow warbler	CSC
	Dipodomys heermanni morroensis	Morro bay kangaroo rat	FE/SE
D	*Neotoma fuscipes (luciana)*	Monterey dusky-footed woodrat	FSC/CSC
	Neotoma lepida intermedia	San Diego desert woodrat	FSC/CSC
D	*Enhydra lutris*	Southern sea otter	FT

D ' Documented to have historically occur within one-mile radius of Morro Bay Power Plant.

Status Codes:

Plants:

Federal Listing

E: Endangered

T: Threatened

SC: Species of Concern

State Listing

E: Endangered

T: Threatened

R: Rare

California Native Plant Society (CNPS):

List 1B =Rare, threatened, or endangered in California and elsewhere.

List 4 = Plants of limited distribution - a watch list.

Wildlife:

ST: State-listed threatened

FT: State-listed threatened

CSC: California State Species of Special Concern

FSC: Federal Special Concern Species

CDFSC: California Department of Forestry Species of Special Concern

MNBMC: Fish and Wildlife Service, Migratory non-game bird of management concern.

* Species that are biologically rare, restricted in distribution, declining throughout their range, or closely associated with a habitat that is declining throughout California.

Table 6.6B-3 Special-Status Plants and Animals Reported From Within a Five-Mile Radius of the Morro Bay Power Plant

Scientific Name	**Common Name**	**Legal Status[a]**
		Federal/State/Other
Plants		
Arctostaphylos cruzensis	See *Arctostaphylos osoensis*	
Arctostaphylos morroensis	Morro manzanita	T/ - / CNPS 1B
Arctostaphylos obispoensis	Bishop manzanita	- / - /CNPS 4
Arctostaphylos osoensis	Oso manzanita	SC/ - /CNPS 1B
Arctostaphylos pechoensis	Pecho manzanita	SC/ - /CNPS 1B
Arctostaphylos tomentosa ssp. Daciticola	Dacite manzanita	SC / - /CNPS 1B
Arctostaphylos wellsii	Well's manzanita	- / - /CNPS 1B
Calochortus clavatus var. clavatus	Club-haired mariposa lily	- / - /CNPS 4
Calystegia subacaulis ssp. Episcopalis	Cambria morning-glory	SC/ - /CNPS 1B
Carex obispoensis	San Luis Obispo sedge	- / - /CNPS 1B
Chorizanthe breweri	Brewer's spineflower	- / - /CNPS 1B
Cirsium fontinale var. obispoense	Chorro Creek bog thistle	E/E/CNPS 1B
Cordylanthus maritimus ssp. maritimus	Salt marsh bird's-beak	E/E/CNPS 1B
Dithyrea maritima	Beach spectacle-pod	SC/T/CNPS 1B
Dudleya abramsii var. bettinae	San Luis Obispo serpentine dudleya	SC/ - /CNPS 1B
Dudleya abramsii var. murina	San Luis Obispo dudleya	- / - / CNPS 4
Dudleya blochmaniae ssp. blochmaniae	Blochman's Dudleya	SC/ - /CNPS 1B
Erigeron blochmaniae	Blochman's leafy daisy	- / - /CNPS 1B
Erigeron sanctarum	Saint's daisy	- / - /CNPS 4
Eriodictyon altissimum	Indian Knob mountain balm	E/E/CNPS 1B

Scientific Name	Common Name	Legal Status[a] Federal/State/Other
Erysimum insulare ssp. Suffrutescens	Suffrutescent wallflower	- / - /CNPS 4
Fritillaria viridea	San Benito fritillaria	SC/ - /CNPS 4
Juncus acutus ssp. Leopoldii	Southwestern spiny rush	- / - /CNPS 4
Lasthenia glabrata ssp. Coulteri	Coulter's goldfields	SC / - /CNPS IB
Layia jonesii	Jones's layia	SC/ - /CNPS 1B
Malacothrix incana	Dunedelion	- / - /CNPS 4
Monardella frutescens	San Luis Obispo monardella	SC / - /CNPS 1B
Monardella undulata	Curly-leafed monardella	- / - /CNPS 4
Mucronea californica	California spineflower	- / - / CNPS 4
Perideridia gairdneri ssp. Gairdneri	Gairdner's yampah	SC/--/CNPS 4
Prunus fasciculata var. punctata	Dune almond	- / - /CNPS 4
Sanicula maritima	Adobe sanicle	SC/R/CNPS 1B
Sidalcea hickmanii ssp. Anomala	Cuesta Pass checkerbloom	SC/R/CNPS 1B
Suaeda californica	California seablite	E/ - /CNPS 1B
Suaeda taxifolia	Woolly seablite	- / - /CNPS 4
Sulcaria isidiifera	Splitting Yarn Lichen	SC / - / -
Wildlife		
Oncorhynchus mykiss	Central California Coast Steelhead Trout	FT
Eucyclogobius newberryi	Tidewater goby	FE/CSC
Helminthoglypta walkeriana	Morro shoulderband snail	FE
Icaricia icarioides moroensis	Morro Bay blue butterfly	FSC
Taricha torosa	Coast Range newt	CSC

Scientific Name	Common Name	Legal Status[a]
		Federal/State/Other
Rana aurora	California red-legged frog	FT
Scaphiopus hammondii	Western spadefoot toad	FSC/CSC
Clemmys marmorata pallida	Southwestern pond turtle	FSC/CSC
Phrynosoma coronatum	Horned lizard	FSC/CSC
Anniella pulchra	Legless lizard	FSC/CSC
Thamnophis hammondii	Two-striped garter snake	CSC
Gavia immer (nesting)	Common loon	CSC/MNBMC
Pelecanus occidentalis	California brown pelican	FE/SE
Phalacrocorax auritus (rookery)	Double-crested cormorant	CSC
Ardes herodias (rookery)	Great blue heron	CDFSC
Botaurus lentiginosus	American bittern	MNBMC
Accipiter cooperi	Cooper's hawk	FE/ST
Accipiter striatus	Sharp-shinned hawk	CSC
Circus cyaneus	Northern harrier	CSC
Elanus caeruleus	White-tailed kite	*
Aquila chrysaetos	Golden eagle	CSC
Falco peregrinus (nesting)	Peregrine falcon	Delisted/SE
Laterallus jamaicensis	California black rail	FSC/ST
Rallus longirostris obsoletuss	California clapper rail	FE/SE
Charadrius alexandrinus (nesting)	Western snowy plover	FT/CSC
Sterna antillarum	California least tern	FE/SE
Brachyramphus marmoratus	Marbled murrelet	FT/SE

Scientific Name	Common Name	Legal Status[a] Federal/State/Other
Athene cunicularia	Burrowing owl	FSC/CSC
Empidonax traillii	Willow flycatcher	SE
Lanius ludovicianus	Loggerhead shrike	FSC/CSC
Riparia riparia	Bank swallow	ST
Dendroica petechia	Yellow warbler	CSC
Dipodomys heermanni morroensis	Morro bay kangaroo rat	FE/SE
Neotoma fuscipes (luciana)	Monterey dusky-footed woodrat	FSC/CSC
Neotoma lepida intermedia	San Diego desert woodrat	FSC/CSC
Enhydra lutris	Southern sea otter	FT

Status Codes:

Plants:

Federal Listing

E: Endangered

T: Threatened

SC: Species of Concern

State Listing

E: Endangered

T: Threatened

R: Rare

California Native Plant Society (CNPS):

List 1B = Rare, threatened, or endangered in California and elsewhere.

List 4 = Plants of limited distribution - a watch list.

Wildlife:

ST: State-listed threatened

FT: State-listed threatened

CSC: California State Species of Special Concern

FSC: Federal Special Concern Species

CDFSC: California Department of Forestry Species of Special Concern

MNBMC: Fish and Wildlife Service, Migratory non-game bird of management concern.

* Species that are biologically rare, restricted in distribution, declining throughout their range, or closely associated with a habitat that is declining throughout California. Indicated California fully protected

6.6B.1.6.1 Distribution of Rare and Endangered Plant Species in the Morro Bay Area

The Terrestrial Biological Survey concludes that no rare and/or endangered plants were detected among plants found on the site, and none would be expected to occur on the site because favorable habitats are not present. Of the 36 species listed below that have been reported from within a five mile radius of the MBPP, five are known or documented to occur within a one-mile radius of the MBPP, three are likely to occur within that radius, and six potentially (but are not known to) occur within a one-mile radius of the MBPP.

Arctostaphylos morroensis **(Morro manzanita)** is endemic to San Luis Obispo County. Its entire known distribution is restricted to the sandy soils (Baywood fine sand) around the southern end of Morro Bay. The species reaches its northern limit in the El Moro Elfin Forest (with minor exceptions such as near the Morro Bay Natural History Museum). Its southernmost and westernmost limits are in the vicinity of Hazard Canyon in Montaña de Oro State Park. It often occurs in monospecific stands on the sandy hillsides south of Los Osos. Morro manzanita habitats around Los Osos south of Morro Bay have been drastically reduced over the years primarily as a result of residential development, which is its major threat. Large populations of the species have already been lost to housing tracts and other aspects of the rapid growth of the Los Osos area. Most of the remaining populations (about 70%) occupy privately owned land that is potentially susceptible to development. No populations are known to occur within one-mile of the MBPP and none were noted on the site itself.

Arctostaphylos obispoensis **(Bishop manzanita)** is endemic to northern San Luis Obispo County and southern Monterey County where it is mostly restricted to serpentine or serpentine-derived soils. It extends from Cuesta Grade north to Monterey County and is often locally abundant where it occurs. No populations are known to occur within one-mile of the MBPP; however, Bishop manzanita is common on serpentine soils on hillsides that traverse Highway 41 a few miles east of the MBPP. This population site is probably the northern extent of the large population of Bishop manzanita that dominates the chaparral areas on Cuesta Grade west of Highway 1.

Arctostaphylos osoensis **(Oso manzanita)** is a highly restricted endemic species known only on the hillsides from Hollister Peak to Park Ridge just **east** of Morro Bay including the following: 1.5 miles SE of the Mouth of Osos Creek east of Morro Bay; 2.4 miles east of Hollister Peak; on the saddle between Hollister Peak and Black Mountain SE of Morro Bay; on bluffs near top of Los Osos Mesa a few miles ESE of Morro Bay; SW part of Cerro Cabrillo; about 0.5 miles west of Hollister Peak; and on ridge between Hazard Canyon and Islay Canyon. It has not been reported within a one-mile radius of MBPP but could be potentially occur on the hillsides just east of Highway 1 and south of Little Morro Creek. Reports of *Arctostaphylos cruzensis* (La Cruz manzanita) from the Morro Bay area are all attributable to this recently described species.

Arctostaphylos pechoensis **(Pecho manzanita)** occurs from the Los Osos area to northern Santa Barbara County. It is represented in the southern Morro Bay area by a population that mixes with and to some degree intergrades with the Morro Manzanita on the sandy hillsides just south of the Los

Osos Creek Bridge. It also occurs on and around Hollister Peak and in the Coon Canyon area. No populations are known to occur within one-mile of the MBPP, and none were noted on the site itself.

Arctostaphylos tomentosa ssp. daciticola **(Dacite manzanita)** is a highly restricted endemic taxon known only on the hillsides from Hollister Peak to Park Ridge just east of Morro Bay. It has not been reported within a one-mile radius of MBPP. However, it occurs primarily on dacite parent material and could potentially occur on the hillsides just east of Highway 1 and south of Little Morro Creek.

Arctostaphylos wellsii **(Well's manzanita)** is endemic to San Luis Obispo County where it occurs from the San Luis Range south to near Nipomo. It is apparently represented in the Los Osos area by a small population of low stature on a ridge above the Cabrillo Estates subdivision. It is not known to occur within one-mile radius of MBPP.

Calochortus clavatus var. clavatus **(Club-haired mariposa lily)** has a distribution limited to San Luis Obispo and Santa Barbara Counties where most occurrences are on serpentine or serpentine-derived soils. It is not known to occur within a one-mile radius of the MBPP, but is known to occur on serpentine hillsides east of Morro Bay.

Calochortus obispoensis **(San Luis mariposa lily)** is endemic to mostly serpentine areas surrounding San Luis Obispo. It occurs on Cuesta Ridge as far west as Pennington Creek and perhaps to Highway 41. It has been reported at the head of Coon Creek along Prefumo Canyon Road SW of San Luis Obispo. No populations are known to occur within a one-mile radius of the MBPP, however, it could possibly occur on serpentine soils on hillsides that traverse Highway 41 a few miles east of the MBPP.

Calystegia subacaulis ssp. episcopalis **(Cambria morning glory)** is a perennial herb with trailing or sometimes weakly twining stems. It is at present known only from San Luis Obispo and northern Santa Barbara counties. In San Luis Obispo County it ranges from the Hearst Ranch area in the northwestern corner of the county south to the vicinity of San Luis Obispo where it usually occurs in grassy sites with clay-rich soils often in association with serpentine parent material. It is documented to occur just north of Highway 1 about 0.6 mile north of summit of Black Hill and along Park Ridge in Morro Bay State Park. It is likely to occur within one-mile of MBPP.

Carex obispoensis **(San Luis Obispo sedge)** is a rhizomatous, perennial herb that grows in large clumps 60 to 180 cm. long, erect, or spreading. It is common along drainages and moist areas in several plant communities associated with serpentine soils. It flowers April to June. *Carex obispoensis* is known only from San Luis Obispo County where its occurrences are localized mostly to moist areas on serpentine or serpentine-derived soils in the Santa Lucia Mountain Range. It is known to occur on serpentine soils in Prefumo Canyon. San Luis Obispo sedge was likely included in the CNDDB for Morro Bay by mistake since the location for it was listed as Prefumo Canyon. No known locations occur within a one-mile radius of MBPP.

Chorizanthe breweri **(Brewer's spineflower)** is an endemic to San Luis Obispo County where most occurrences are on serpentine or serpentine-derived soils. It occurs only in San Luis Obispo County west of Highway 101 on Cuesta Grade to the hills around the city of San Luis Obispo and west to Highway 41. Within this range, it is locally common on dry serpentine slopes. No populations are known to occur within a one-mile radius of the MBPP; however, it does grow along Highway 41 a few miles east of MBPP.

Cirsium fontinale var. obispoense **(Chorro Creek bog thistle)** occurs only in San Luis Obispo County where it is found in very localized wetlands on serpentine or serpentinite-derived soils. These include springs and permanently wet sites in stream channels. It occurs in the vicinity of San Luis Obispo, about 1 mile SW of Cerro Alto Lookout (head of San Bernardo Creek), and in one site east of San Simeon. At present it is known from only six localities, and it apparently has been extirpated from one of these. No known populations of this plant occur within a one-mile radius of the MBPP.

Cordylanthus maritimus ssp. maritimus **(Salt marsh bird's-beak)** occurs in coastal salt marshes from northern Baja California to San Luis Obispo County. In the Morro Bay area the Salt Marsh bird's beak has been observed in one of the embayments on the leeward side of the northern end of the Morro Bay Sand Spit, at the south end of Morro Bay near Mitchell Drive, and near the Sweet Springs Marsh at Baywood Park. The latter population (by far the larger of the two) occurs in the fringe area where fresh water from the shallow water table blends with the salt water of the bay. The population at the north end of Morro Bay Sand Spit near the mouth of Morro Bay is within a one-mile radius of the MBPP.

Dithyrea maritima **(Beach spectacle-pod)** occurs in foredunes along the coast from northern Baja California to San Luis Obispo County and on two of the California Channel Islands. It reaches its northernmost limit on the Morro Bay Sand Spit where it is very localized and has also been reported from Montaña de Oro State Park 0.9 miles WNW of the junction of Los Osos Valley Road and Pecho Road. It is likely to occur within a one-mile radius of the MBPP on the sand spit and possibly in the dunes north of MBPP.

Dudleya abramsii var. bettinae **(San Luis Obispo serpentine dudleya)** is endemic to San Luis Obispo County and it is apparently limited to stony serpentine soils and serpentine rock outcrops. Its range is limited to the San Luis Range and foothills of the Santa Lucia Mountains. A large population is known to occur near the dam of Whale Rock Reservoir and smaller populations occur on serpentine soils along Highway 1 near Toro Creek Road, one-mile east of Highway 1 near San Bernardo Creek, and along Highway 41 east of Morro Bay. A small population occurs on a grassy slope above Highway 1 approximately one-mile east of MBPP.

Dudleya abramsii ssp. murina **(San Luis Obispo dudleya)** is endemic to San Luis Obispo County and it is apparently limited to stony serpentine soils and serpentine rock outcrops. Its range is limited to the hills bordering the San Luis Valley in the foothills of the Santa Lucia Mountains from Chorro Creek to Corral de Piedra Creek and in the San Luis Range from upper Prefumo Canyon to Highway 101. No known populations of this plant occur within a one-mile radius of the MBPP.

Dudleya blochmaniae ssp. blochmaniae **(Blochman's dudleya)** extends from northern Baja California to San Luis Obispo County **where** it occurs on clay soils (usually derived from serpentine) from Cayucos to Turri Road and on the hills bordering the western part of the San Luis Valley. In the Morro Bay area small populations occur between Turri Road and the border of the salt marsh about 1/4 mile E of South Bay Blvd., on the hillsides N of Turri Road, and along Park Ridge in Morro Bay State Park. No known populations of this species occur within a one-mile radius of the MBPP.

***Erigeron blochmaniae* (Blochman's leafy daisy)** occurs on stabilized dunes near the ocean inland to old sand dunes from Los Osos/Morro Bay to northern Santa Barbara County. In the Morro Bay area it ranges from the Morro Bay Sand Spit and the hills near the Los Osos Junior High School to Montaña de Oro State Park and the chaparral-covered hills above Los Osos. It potentially occurs within a one-mile radius of MBPP on the sand spit and possibly in the dunes just west and north of MBPP.

***Erigeron sanctarum* (Saint's daisy)** is known from northwestern San Luis Obispo County (in the vicinity of Arroyo de la Cruz) to Santa Barbara County where it occurs both on the mainland and on Santa Rosa Island. In the Morro Bay area it has been found only on a ridge top about 1/4 mile west of the junction of Calle Cordoniz and Bayview Heights Drive along a trail through the chaparral and on the slopes below Valencia Peak in Montaña de Oro State Park. It is not known to occur within a one-mile radius of the MBPP.

***Eriodictyon altissimum* (Indian Knob mountain balm)** is a slender shrub that is endemic to a very small portion of San Luis Obispo County. It is known to occur only in two areas of the San Luis Range. One population occurs on Indian Knob south of San Luis Obispo. Three very small, isolated populations occur in the hills just south of Los Osos. The Los Osos/Morro Bay area populations occur (1) west of Calle Cordoniz, south of its junction with Bayview Heights Drive, (2) south of Highland Drive between the extensions of Ravenna Avenue and Palisades Avenue, (3) at two sites north of Hazard Canyon in Montaña de Oro State Park. No populations are known to occur within a one-mile radius of MBPP.

***Erysimum insulare ssp suffrutescens* (suffrutescent wallflower)** occurs on coastal sand dunes from the Morro Bay area to Los Angeles County. In the Morro Bay area it is an occasional to locally common component of coastal dune scrub communities. Small, localized populations are scattered throughout the Los Osos area as far north as the Turri Road/South Bay Blvd. Area (El Moro Elfin Forest) many of them on private land. In the Montaña de Oro area it is an occasional to locally common component of coastal dune scrub communities. It has been documented to occur within one-mile of MBPP on the sand spit and it may occur on the dunes north of MBPP.

***Fritillaria viridea* (San Benito fritillaria)** is a bulbous herb with nodding flowers that range from pale green to black. It grows on serpentine slopes from 200 to 1500 meter elevations in San Benito and San Luis Obispo Counties. Its only reported location near Morro Bay is 6 miles above Morro Bay along Highway 41. No known populations have been reported within a one-mile radius of the MBPP.

***Juncus acutus ssp. leopoldii* (Southwestern spiny rush)** is a densely tufted perennial herb that occurs from Baja California north to San Luis Obispo County. In the Morro Bay area it occurs in areas of the coastal salt marsh where there is some fresh water inflow. It is locally common in the southern portion of Morro Bay, and it potentially could occur in other sites in the Morro Bay salt marsh, possibly within a one-mile radius of MBPP.

***Lasthenia glabrata ssp. coulteri* (Coulter's goldfields)** is an annual plant that occurs from northern Baja California to San Luis Obispo County. It apparently has been extirpated from several counties in southern California. The only documented occurrence in San Luis Obispo County is from Sweet Springs Marsh in Baywood Park where a very small, very local population occurs in the salt marsh. It potentially could occur in other sites in the Morro Bay salt marsh, possibly within a one-mile radius of MBPP.

***Layia jonesii* (Jones' layia)** is an annual plant known to occur only in Monterey and San Luis Obispo Counties where it occurs mostly on clay soils in areas of serpentine. In San Luis Obispo County it is known from Cayucos (where it has apparently been extirpated) to the hills around San Luis Obispo including sites just west of Los Osos Valley Road. It was found one-mile east of Highway 1 near San Bernardo Creek, in the Odd Fellows Cemetery near the mouth of Toro Creek, and in an unspecified site on coastal mesas near Morro Bay. Its historical distribution includes areas from Toro Creek to Morro Creek are within a one-mile radius of the MBPP.

***Malacothrix incana* (Dunedelion)** occurs in the foredunes along the immediate coast from Ventura County to San Luis Obispo County and on the Santa Rosa and San Miguel Islands. It is a perennial herb that grows in foredune habitats. Dunedelion occurs on the Morro Bay Sand Spit and could potentially occur in the dunes west and north of MBPP within a one-mile radius of the power plant.

***Monardella undulata* (curly leafed monardella)** is an annual plant that occurs on coastal sand dunes from Sonoma County to San Luis Obispo County where it reaches its southernmost location in the Morro Bay area. The closest populations to the north are in Monterey County. In the Morro Bay area it occurs as an occasional to locally common component of coastal dune scrub communities as far north as the Los Osos Junior High School. Some individuals have been misidentified as *Monardella frutescens*, which does not occur in the Morro Bay area. No known populations occur within a one-mile radius of MBPP although potential habitats occur.

***Monardella frutescens* (San Luis monardella)** was reported by Howe in 1963 to be south of Morro Bay. No recent reports of this plant have been found, and it is believed that it may have been a misidentification of *Monadella undulata*, a very similar plant.

***Mucronea californica* (California spineflower)** is a short, widely branching, brittle-stemmed annual herb with small flowers at the nodes. California spineflower occurs both in coastal and interior sandy sites from Monterey and Kern counties south to San Diego County. It often occurs in coastal scrub and coastal dune scrub. It also occurs in disturbed open areas of the coastal dune scrub and around the fringe of unstabilized dunes. No known populations occur with one-mile of the MBPP although potential habitats are present in the sand dunes near MBPP.

***Perideridia gairdneri subsp. gairdneri* (Gairdner's Yampah)** historically was known from coastal areas ranging from Marin and Napa Counties to San Diego County. It apparently has been extirpated from San Diego, Orange, Los Angeles, and San Mateo Counties. Populations are threatened elsewhere by development. In San Luis Obispo County this species has been found in the vicinity of Arroyo de la Cruz in the northwest to the hills around San Luis Obispo. No known populations of this species occur within a one-mile radius of the MBPP.

***Prunus fasciculata var. punctata* (Dune almond)** occurs on coastal sand dunes from the Morro Bay area to northern Santa Barbara County. In the Morro Bay area it occurs as an occasional to locally common component of coastal dune scrub and maritime chaparral communities. No known populations occur within a one-mile radius of the MBPP although potential habitats are present.

***Sanicula maritima* (Adobe sanicle)** historically occurred from San Francisco to San Luis Obispo Counties. All occurrences in the San Francisco Bay region have apparently been extirpated, and it is known at present only from Southern Monterey and San Luis Obispo counties. Adobe sanicle is a perennial herb that occurs on seasonally moist clay soils that bake hard in the summer. Populations are known from the Arroyo de la Cruz area north of San Simeon and from Cerro Romauldo to Laguna Lake Park near San Luis Obispo. No populations of this species have been documented in the Morro Bay area.

***Sidalcea hickmanii ssp. anomala* (Cuesta Pass checkerbloom)** is a perennial herb known only from serpentine soils in the Cuesta Pass area a few miles east of Morro Bay. It is unlikely that this species occurs within a one-mile radius of MBPP.

***Suaeda californica* (California seablite)** formerly occurred in salt marshes from Sonoma County to San Luis Obispo County. All populations north of San Luis Obispo have apparently been extirpated and the remaining range is now restricted to Cayucos and Morro Bay. Reported distribution includes Morro Bay State Park from Fairbanks Point south to White Point and East beyond the campground, south and west shores of Morro Bay including the sand spit, west end of 8th Street in Morro Bay, east shore of Morro Bay from 2nd Street south to boat ramp, and north shore of Morro Bay just east of Morro Rock. The plants typically occur at the edge of the salt marsh just above the low tide line. It occurs within a one-mile radius of the MBPP.

***Suaeda taxifolia* (Woolly seablite)** is an evergreen shrub with pubescent leaves giving it a grayish-green cast. It occurs along margins of coastal salt marshes and seabluffs in central and southern California. The nearest know population occurs at the base of the sea cliff opposite the intersection of Cypress Street and San Luis Avenue in Pismo Beach. It is not known to occur on the margins of the Morro Bay salt marsh or within a one-mile radius of MBPP.

***Sulcaria isidiifera* (Splitting Yarn Lichen)** is an epiphytic lichen that grows on coast live oak, chamise, and ceanothus, and other shrubs in Los Oso Oaks State Park and the El Moro Elfin Forest. Its distribution has not been completely studied, but it was not found within one-mile of the MBPP.

6.6B.1.6.2 Species Account and Distribution of Endangered, Threatened or Special Concern Wildlife Species Occurring Within One-mile of the MBPP

The Terrestrial Biological Survey concludes that no terrestrial threatened or endangered wildlife species were found on the MBPP site. The CDFG Natural Diversity Data Base listed 11 species that are known to occur within Morro Bay North and Morro Bay South quadrangles. The "special species" list of the CDFG Natural Heritage Division (May 24, 2000) indicates an additional 26 special species that may occur within one-mile. These 37 species are listed below and then briefly discussed in relationship to the MBPP. Of the 37 species, 16 are identified as present; however, only three species were actually observed to be present at the MBPP (the other 13 can be observed, or are known to occur, in habitats adjacent to the MBPP); 6 species are identified as potentially present although none were observed during field visits; 12 species were determined not to be present through either species-specific surveys or other means; and presence remains questionable for three species although completed survey work did not establish presence (Morro shoulderband snail, California legless lizard and the tidewater goby). See Section 6.6A for discussion of tidewater goby.

Table 6.6B-4 provides a summary of the presence or presumed presence of each special status species, and whether a species-specific survey was undertaken to determine presence/absence:

Surveys: If a species is indicated as present or absent and no species-specific survey was conducted, the distributional data were previously known, or determined through a general site survey. Only when the local distribution of a species was in doubt was a species-specific survey undertaken. In some cases species are difficult to detect at low densities so they were presumed present (rather than presumed absent).

Threatened and endangered species: The distribution of all threatened and endangered species was investigated in every case. This was done_in order to determine conditions that might require mitigation.

Other special status species: For species with status other than threatened or endangered, presence indicates known or expected occurrence, rather than actual occurrence. General and species specific surveys were conducted for any non-threatened or endangered species if development was potentially going to destroy potential or suitable habitat. These surveys were conducted in order to identify conditions that might require mitigation.

Potential habitat is defined as habitat that appears to be suitable but within which no representatives of the species in question could be discovered. Suitable habitat is habitat in which there is at least one individual of the species in question and thus habitat suitability is demonstrated rather than inferred (potential).

Table 6.6B-4. Special-Status Animals Documented From or Likely to Occur Within or Adjacent to the Morro Bay Power Plant

Status column indicates what a species' listing is. Present column indicates whether the species is known to occur within one-mile (Y), is presumed to occur given the presence of potential habitat (P), or is known to not occur within one-mile (N) of the MBPP. An "A" indicates that additional data may be required to determine presence/absence. See species accounts below. Survey column indicates whether this study includes a species-specific survey for a particular species. If one was conducted it is discussed in detail within that section of the report. Y/N indicates that some surveying was completed, but that a complete survey for the Morro shoulderband snail and the California legless lizard was not feasible due to seasonal constraints related to the optimal time to conduct the survey. The survey that was conducted did not produce evidence for the presence of either of these two species. It cannot however be ruled out that either of these species are present at the MBPP (at least in small numbers), however it is unlikely they are present and would not be common or abundant. See species accounts, impacts and mitigation for Morro shoulderband snails and legless lizards.

Species	Common name	Status	Present	Survey
Oncorhynchus mykiss	Central California Steelhead Trout	FT	Y	Y
Eucyclogobius newberryi	Tidewater goby	FE/CSC	A**	Y
Helminthoglypta walkeriana	Morro shoulderband snail	FE	A	Y/N
Icarici icarioide moroensis	Morro Bay blue butterfly	FSC	P	
Danaus plexippus	Monarch butterfly	*	Y	
Taricha torosa	California newt	CSC	P	
Rana aurora	California red-legged frog	FT	N	Y
Scaphiopus hammondii	Western spadefoot toad	FSC/CSC	P	
Clemmys marmorata pallida	Southwestern pond turtle	FSC/CSC	N	Y
Phrynosoma coronatum	Horned lizard	FSC/CSC	P	
Anniella pulchra	California legless lizard	FSC/CSC	A	Y/N
Thamnophis hammondii	Two-striped garter snake	CSC	P	
Gavia immer (nesting)	Common loon	CSC/MNBMC	N	
Pelecanus occidentalis	California brown pelican	FE/SE	Y	
Phalacrocorax auritus (rookery)	Double-crested cormorant	CSC	Y	
Ardes herodias (rookery)	Great blue heron	CDFSC	N	

Species	Common name	Status	Present	Survey
Table 6.6B.4 (Continued)				
Botaurus lentiginosus	American bittern	MNBMC	Y	
Accipiter cooperi	Cooper's hawk	FE/ST	Y	
Accipiter striatus	Sharp-shinned hawk	CSC	Y	
Circus cyaneus	Northern harrier	CSC	Y	
Elanus caeruleus (nesting)	White-tailed kite	CSFP/MNBMC	Y	
Aquila chrysaetos	Golden eagle	CSC	Y	
Falco peregrinus (nesting)	Peregrine falcon	FE/SE (Delisted 8/25/99)	Y	
Laterallus jamaicensis	California black rail	FSC/ST	N	
Rallus longirostris obsoletuss	California clapper rail	FE/SE	N	
Charadrius alexandrinus(nesting)	Western snowy plover	FT/CSC	Y	
Sterna antillarum	California Least tern	FE/SE	P	
Brachyramphus marmoratus	Marbled murrelet	FT/SE	Y	
Athene cunicularia	Burrowing owl (burrow sites)	CSC/MNBMC	Y	Y
Empidonax traillii	Willow flycatcher	SE	N	Y
Lanius ludovicianus	Loggerhead shrike	FSC/CSC	N	Y
Riparia riparia	Bank swallow	ST	N	Y
Dendroica petechia	Yellow warbler	CSC	N	Y
Dipodomys heermanni Morroensis	Morro bay kangaroo rat	FE/SE	N	
Neotoma fuscipes (Luciana)	Monterey dusky-footed woodrat	FSC/CSC	Y	Y
Neotoma lepida intermedia	San Diego desert woodrat	FSC/CSC	N	Y
Enhydra lutris	Southern sea otter	FT	Y	

* Not state or federally protected (has CNDDB rank of G5S3); presented for informational purposes. ** See Section 6.6A for a description of the DNA analysis used to determine presence or absence of the tidewater goby. FE: Federally-Listed Endangered FT: Federally-Listed as Threatened SE: State-Listed Endangered	ST: State-Listed Threatened CSC: California State Species of Special Concern FSC: Federal Special Concern Species CDFSC: California Department of Forestry Species of Special Concern CSFP: California State fully protected

California Central Coast Steelhead Trout is an evolutionarily significant unit (ESU) known to occur in Morro Creek (Dr. Royden Nakamura, Cal Poly, San Luis Obispo pers. comm.; see also CNDDB). It is listed as Endangered under the CESA and threatened under the ESA. Morro Creek traverses the northern portion of the MBPP approximately 200 feet north of the Tank Farm at some locations. Morro Creek is a typical coastal creek in that it periodically dries in its lower reaches. In years that it does dry it does not provide suitable habitat for steelhead except for persistent upstream pools that are cool enough to maintain fish populations. Movement into the stream may not be possible in these years and populations are therefore subject to local extinction (due to chance events or poor habitat quality). Yet, an unoccupied stream does not represent an unsuitable stream. Central California coastal streams are expected to not have steelhead in some years (following particularly dry periods), but are also expected to periodically be re-colonized by fish that stray from their natal stream, or that have been in the marine ecosystem awaiting an opportunity to return to their natal stream to spawn. A survey was conducted in order to determine if Central California Steelhead trout currently occupy Morro Creek (see discussion below).

Morro Creek has a diversity of habitats. Some of these habitats include those used by steelhead. For example, in the first large meander up from the creek mouth there is a deep pool (over 3 feet) that has roots overhanging at the water's surface. This is a portion of bank that has been eroded. The roots entrap floating vegetation that could improve aquatic and terrestrial insect production and serve as resting and rearing habitat for steelhead. Several pools of this nature exist along the creek. Likewise, several stretches of bank have been undercut and still retain vegetative cover and important habitat for steelhead.

<u>Terrestrial Biological Species Survey</u> - A visual survey was conducted for steelhead on June 16, 2000. Several areas with undercut banks or near surface vegetation extending out over the water were examined. Each of the potential pools or banks was approached from the opposite bank. All fish that could be sighted were identified to species using 8x40 binoculars (focal depth of 4 feet from the observer). Field characteristics used to identify steelhead in the water included: pinkish lateral line, dark spots on light background, and a small adipose fin. Even when not in the hand, these traits allow identification relative to other potential salmonids. Five individuals were observed in the first, large, "S" shaped, meander up from the creek's mouth.

The survey results show that, at least during the summer of 2000, steelhead trout were present in Morro Creek. As such, it is expected that even if a population went locally extinct due to low water flow, the population would likely be re-established in a subsequent year.

Tidewater Goby is a native species that enters fresh water. They have a wide distribution within California from San Diego to Arcata, but they are not considered common except in Morro Bay (Schoenherr 1992). This species is known from creeks to the north (Cayucos Creek) and to the south (San Luis Obispo Creek) of Morro Creek (Swift et. al. 1993). It is a potential inhabitant of Morro Creek, yet is not recorded from there. This species was included in the wildlife portion of this survey at the request of the City of Morro Bay. A separate study that included a morphometric and DNA diagnostic analysis of larval Gobidae from Morro Bay that were collected in front of the MBPP cooling water intake and at several Morro Bay source water stations, is discussed in Section 6.6A "Marine Biology". Results of the DNA test indicate that none of the specimens tested were tidewater goby.

A large lagoon forms at the mouth of Morro Creek during the summer as sand built up during the summer acts to partially impound the stream's flow. This generally causes a large meander across the beach and an eventual outflow to the ocean. This outflow can be 100-150 feet from the permanent channel. The lagoon is generally within the reach of the high tide. As a result a lagoon can form at the mouth of the creek, where the most abundant plant material is kelp. The kelp is washed in with the high tide, and the stream flow is often not sufficient to push it back out to sea. Clearly, this portion of the stream is brackish. The salinity is appropriate for tidewater gobies, and the kelp within the lagoon provides cover.

Terrestrial Biological Species Survey - A visual survey was conducted for the tidewater goby. The entire lagoon was searched on 18 July 2000. Transects at one meter intervals were walked through the lagoon in order to obtain 100 percent coverage. All gobioid fishes were observed with 8x40 binoculars (with a focal length of 4 feet) in order to identify individuals to species. This approach, and verification of appropriate diagnostic characters used for identification, was developed in consultation with Cal Poly Ichthyologist Dr. Royden Nakamura. No adult tidewater gobies were discovered through the survey. Potential habitat is present, but no evidence of occupation was obtained.

Morro shoulderband snail is a federally listed endangered species. Critical habitat was designated for this species by the USFWS on July 12, 2000. Critical habitat consists of three patches south of the channel into Morro Bay. The MBPP lies outside of designated critical habitat.

Historically, the shoulderband snail, *Helminthoglypta walkeriana*, is known to occur in limited numbers on stabilized, vegetated, Flandrian-age dunes in the vicinity of Morro Bay, California. Some additional occurrences have also been reported on older pre-Flandrian dunes just south of Morro Bay (Roth, 1985). The shoulderband snail typically occurs in close association with *Lupinus chamissonis*, silver beach lupine, (Hochberg & Miller, 1989) and *Ericameria ericoides*, mock heather (Roth, 1985). Both of these shrubs are quite common in the coastal dune scrub community. The *Lupinus* and *Ericameria* species occurs in a patch of dune scrub adjacent to the tank farm (between the tank farm and the unpaved Embarcadero roadway) and within the tank farm itself.

Shoulderband snails have also been found in association with the introduced narrow-leafed ice plant, *Conicosia elongata* (Roth, 1985). In some localities the ice plant can be the source of the highest density of individuals (Ed Reaves, Cal Poly, pers. comm.). This plant is abundant throughout the tank farm and adjacent areas. The exact geographic distribution of this species is as difficult to pin down as is its taxonomy and ecology. Best reports indicate that the main portion of the range extends from Baywood Park (south of the city of Morro Bay), around the southern edge of Morro Bay (Shark's Inlet), north along the Morro Bay Sand Spit, as well as south along the coast to near Islay creek (Hill 1974). The subspecies *H. w. morroensis* is known from coastal dune habitats between Cayucos and Morro Bay. Efforts to relocate it after it was originally described in the literature have been unsuccessful (Roth 1985). If any Morro shoulderband snails were found on site, the form of *H. walkeriana* would presumably be of the *morroensis* form. This would effectively constitute a rediscovery of the subspecies.

The tank farm area of the MBPP is dominated by the introduced narrow-leafed ice plant. There are silver beach lupines and mock heather within the tank farm and in the adjacent Den Dulk parcels. During site visits (Jan. and Feb. 1999) multiple empty shells of *Helminthoglypta* were recorded from and near the tank sites. Likewise, live *Helminthoglypta* and European snails (*Helix*) were observed in abundance. None of the shells or live snails represented the listed *Helminthoglypta walkeriana*. Based on these observations it was concluded that the tank farm area of the MBPP constitutes suitable habitat for *Helminthoglypta* species.

To determine whether the habitat was indeed suitable for *Helminthoglypta walkeriana* and to determine if the listed subspecies (presumably *Helminthoglypta walkeriana morroensis*) was indeed present, a qualified biologist (Ed Reaves, California Polytechnic State University (Cal Poly). San Luis Obispo) was retained for this work. Given the potential that multiple species would have to be censused (see following species specific survey accounts), and that censussing for some species (i.e.: legless lizards) might result in take or habitat destruction for *Helminthoglypta walkeriana,* snail surveys were conducted before any other surveys were considered. Surveys for *Helminthoglypta walkeriana morroensis* were not able to be conducted using USFWS protocols since the designation of suitable habitat was made following the rainy season and the accepted protocol indicates that the search is most effectively done following significant precipitation. Likewise, the Den Dulk parcels were not searched. They were added to the scope of work in late summer 2000. All censuses for other species that followed the shoulderband snail census proceeded under the assumption that this species was present.

Ed Reaves (May 29, 1999) made the determination that the tank farm area represents suitable habitat for the Big Sur shoulderband snail and potential habitat for *Helminthoglypta walkeriana.* This determination was based on: an evaluation of the plant species composition, the extent of vegetative ground cover, and the discovery of multiple *Helminthoglypta* individuals in areas of most suitable habitat. All of the *Helminthoglypta* discovered were the Big Sur shoulderband snails, and none were *Helminthoglypta walkeriana*. Given the presence of a congener, potential habitat, and the fact that the Big Sur and the Morro shoulderband snails co-occur in areas of Los Osos and Morro Bay, a more extensive survey was initiated to determine if any *Helminthoglypta walkeriana morroensis* occur on site.

Terrestrial Biological Species Survey - The protocol outlined below was employed to try and discover evidence for the presence of *Helminthoglypta walkeriana*. Ed Reaves, a qualified USFWS *Helminthoglypta walkeriana* biologist, conducted the entire survey. The USFWS accepted protocol was not applied since the rainy season had passed. The accepted protocol is most effectively done following rains or significant precipitation. This allows the habitat surface to be surveyed without the need to search through vegetation. This is the only protocol that does not result in potential destruction of habitat. The protocol employed was designed to maximize the possibility of discovering Morro shoulderband snails, while eliminating the potential for impact from the survey itself. Based on an initial survey (May 29, 2000) Mr. Reaves determined that the vast majority of the Big Sur shoulderband snails were active rather than aestivating. From this observation it was determined that it would be extremely unlikely that a survey would disrupt an aestivating Morro shoulderband snail (if present). The cool winter and persistent early summer fog of the year likely contributed to the low aestivation frequency in encountered snails.

Habitat areas were ranked based on their suitability for *Helminthoglypta walkeriana*. Top quality potential habitat was searched first and then progressively poorer and poorer potential habitat was incorporated into the survey. The logic behind this approach was that the better the habitat the higher the probability of detecting *Helminthoglypta walkeriana*. Once detected, all surveying would cease and habitat disturbance would be minimized. The best habitat constituted areas around a fresh water pipe leak in the tank farm. Second best were large patches of silver beach lupine or iceplant. Third best were single beach lupines or small patches of iceplant. At each survey site the vegetation was manually parted and separated down to the ground level and inspected for the presence of snails or snail shells. In some cases the habitat patch was clearly circumscribed (i.e.: under a single silver beach lupine) and the entire patch could be searched. In other cases (i.e.: a large swath of ice plant) the entire patch could not be searched, so it was sampled along transects (with search sites spaced at 3-5 meter intervals). The best habitat did not produce evidence for the presence of *Helminthoglypta walkeriana;* therefore all potential habitat was eventually incorporated into the survey. A total of 6 hours was spent conducting the field survey in potential habitat within the tank farm (May 29, and June 13, 1999).

Not a single *Helminthoglypta walkeriana* was discovered during the survey, though hundreds of the Big Sur snails were discovered. In addition, in over 80 hours of field related activity at the upland portions of the MBPP only Big Sur Dune Snail shells have been encountered. No shells of *Helminthoglypta walkeriana* have been recovered from any habitat within or adjacent to the MBPP. It cannot be ruled out that the Morro Bay shoulderband snail is present (at least in small numbers) at the MBPP, however, it is unlikely that they are present and they are certainly not common or abundant.

The Morro blue butterfly is known to occur in the coastal dune scrub areas around the MBPP. It is almost always found on or in the immediate vicinity of its food plant host *Lupinus chamissonis* (the silver beach lupine). Some silver beach lupines occur within the tank site. This plant species also occurs within the Den Dulk parcels. A specific survey for the Morro blue was not undertaken, because it was presumed to be present. Potential habitat is present though the coastal scrub community is degraded. However, no individuals of this species were observed in over 80 hours of fieldwork on the power plant property or in over 12 hours in the Den Dulk parcels.

The Monarch butterfly (*Danaus plexippus*) is not currently federally or state protected, but is discussed here for informational purposes. Monarch butterfly (wintering sites) are classified as "demonstrably secure" worldwide but within California are considered of "restricted range; rare." This species is a winter resident of the California coastline. By late October, monarchs have migrated to wintering sites in central Mexico and the California coast (Leong et al. 1991). These winter colonies stabilize by November and remain through most of February or until the beginning of March. In the City of Morro Bay wintering colonies exist at the Morro Bay Gulf Course, Morro Bay State Park, Eagle Rock (highest topographical point in the City of Morro Bay), North of Surf St. (between Main and Morro), SE of Morro and South St. intersection, west side of Southbay Blvd., 0.5 miles South of Highway 1, and the east shore of Morro Bay between Fairbanks and White points. Wintering aggregations of monarch butterflies in California can primarily be found on Monterey pines (*Pinus radiata*) and in eucalyptus (*Eucalyptus sp.*) groves (Sakai and Calvert 1991). Wintering habitat components frequently include sources of moisture such as streams, ponds or abundant morning dew. Other habitat preferences include little direct sunlight, minimal wind, and moist ambient conditions. Monarchs are known to roost in the Eucalyptus planted on the MBPP. These butterflies are most common in the area between Highway 1 and Willow Camp Creek, and on the slopes just south of the Main St. access in the SE corner of the plant. Neither of these areas is considered an overwintering site (Dr. Dennis Frey, Cal Poly), but rather they are fall aggregation sites. As such they serve to focus animals into the overwintering sites. The Biological Survey has indicated that removal, thinning, or disturbance of these trees would have an adverse impact on the habitat of these sites.

California Newts breed (Dec-May) in streams and permanent standing water. During non-breeding periods individuals are found beneath leaf or other vegetative litter. Occurrence of this species in a particular habitat can generally only be determined through directed census during non-breeding seasons (i.e.: pit or can traps). Morro Creek traverses the northwestern portion of the MBPP approximately 200 feet north of the Tank Farm. This creek represents potential habitat for breeding newts. However, no newts were observed during fieldwork in the creek in either field season (1999 or 2000). The tank farm site itself does not represent potential habitat for California newts (insufficient moisture). But the northern portion of MBPP adjacent to the creek where there is moist, dense vegetation, does represent potential habitat. Likewise, most of the wetland habitats along the northeastern portion of MBPP (along Willow Camp creek) would represent potential habitat. The species is presumed present though no individuals of this species were observed in over 25 hours of observations in Morro Creek.

The California red-legged frog (CRLF) was listed as federally threatened on June 24, 1996. CRLFs use a variety of aquatic and terrestrial habitats, including streams, marshes, ponds, riparian woodlands, springs, lagoons, irrigation canals, wells, reservoirs, and even sewage treatment ponds. An apparent requirement for red-legged frogs is the presence of perennial or near perennial standing water. They prefer pools with dense overhanging vegetation; however, they have been known to occur in shallow pools devoid of vegetation. Based on research by Jennings and Hayes (1985), in stream habitats red-legged frogs require at least intermittent flows with some standing water, water at least 28 inches deep, and dense shoreline vegetation that lacks introduced bullfrogs and other introduced predators and competitors. Cattails (*Typha*), tules (*Scirpus*), or willows (*Salix*) are typically associated with the presence of red-legged frogs. Canopy cover keeps the water temperature low, a particularly important habitat requirement for red-legged frogs (Hayes 1990).

These frogs are known to have been more broadly distributed in San Luis Obispo County during recent times. There are several factors that have contributed to their decline, including habitat loss, over-exploitation, the introduction of exotic predators, reservoir construction, and grazing. Their range historically extended from Shasta County, California to Baja California. The range has since been reduced by at least 70 percent. Populations are known to occur presently in approximately 238 streams or drainages in 23 counties. Its current range extends from northern Baja California to Marin County, California. It is found primarily in coastal drainages and in isolated drainages in the Sierra Nevada, northern Transverse Range, and north coast of California.

Within San Luis Obispo County CRLFs are found in many streams, stock ponds, dune ponds, and springs on the coastal plain and western slopes of the Santa Lucia Range from San Carpoforo Creek in the north to the Santa Maria River, in the south (USFWS 2000). Known locations include Pico, Little Pico, Toro, San Simeon, Villa, Santa Rosa, Chorro, and Arroyo Grande creeks; tributaries to Chorro Creek and Chorro Reservoir; Pico Pond; dune ponds in the Nipomo/Guadalupe Dune complex; Whiskey Spring on Camp San Luis Obispo; and other sites (USFWS 2000, Julie Schneider pers. comm.). As such, CRLFs are known from the next creeks north and south of Morro Creek.

Dr. Fred Andoli, herpetologist at Cal Poly, has found them in only a few places. A local biologist (Dr. Mike Hanson - Cal Poly San Luis Obispo) has not found red-legged frogs in the 18 years that he has conducted surveys in local streams, ponds, and marshes. Based on the CNDDB records, there are 2 locations within a 5-mile radius where CRLF have been found recently. In Toro Creek, located approximately 2.5 miles north of Morro Creek, there is a report of 2 CRLF found in 1996. Approximately 2.5 miles southeast of Morro Creek, in San Bernardo Creek, a single CRLF was found in 1996. In 1998 red-legged frogs were discovered in a secluded spring on Camp San Luis Obispo.

Based on habitat quality alone, it is difficult to predict whether red-legged frogs will be present at any particular site. Potential habitats are often not occupied. Multiple potential habitats exist adjacent to the tank farms site at the MBPP. These include Morro and Willow Camp creeks. There is a high level of probability that CRLF were found historically in Morro Creek. It is possible that red-legged frogs may persist in Morro Creek, which represents potential habitat. If they do persist they would be expected to occur in persistent pools in its upper parts, along densely vegetated (*Salix*) portions of the lower creek, or along Willow Camp Creek.

Terrestrial Biological Species Survey - A species-specific survey using USFWS protocols (including night time observations) was conducted during the summer of 2000 using approved survey protocols to determine whether the species was present or not. At the time of the field surveys there was water flowing in the creek, however, in recent years most of the creek is dry by late summer. The average depth of water in the creek was about 6 inches with occasional dips that reached a maximum depth of about 12 inches. In the approximately 1-mile reach of the stream that was surveyed there were 15 small pools that offered potential year round habitat for CRLF. The remainder of the creek would be used mostly as a travel corridor during the summer months. CRLF prefer these small pools for feeding and resting, probably because they can dive down to escape predators such as raccoons.

The methods used in the survey followed the guidelines presented by the USFWS (1998). Biologist Julie Schneider conducted a survey on August 3, 2000. The second set of surveys were conducted on August 7, 2000. The creek bottom and adjacent bank habitat were surveyed for CRLF beginning at the creek mouth and continuing upstream to where the creek intersects Highway 41, a distance of approximately one-mile. This portion of Morro Creek was surveyed twice during the day and twice at night for a total of 4 surveys.

Daytime surveys were conducted between the hours of 5 PM to 7:30 PM with temperatures in the high 70s (^{0}F). Night surveys were conducted between the hours of 9:30 PM to 11:30 PM with temperatures in the mid-60s (^{0}F). Surveyors walked upstream through the bottom of the creek channel. The riparian areas, pools, and stream edges were all surveyed visually during daylight hours for frogs, tadpoles, and eggs. These same areas were surveyed at night for eyeshine, using 6-volt headlamps. In addition to visual observations, the surveyors also listened for sounds that would identify wildlife species present in the area. Inquiries were made to other knowledgeable biologists regarding known sightings of CRLF in the surrounding area. Biologists that were contacted included: Dr. Fred Andoli, Dr. Mike Hanson, and Dr. Galen Rathbun.

There were no CRLF seen or heard, nor were any egg masses or tadpoles found in Morro Creek during any of the surveys. Neither bullfrogs nor crayfish were found in Morro Creek during the surveys. Morro Creek does not appear to currently support CRLFs, although it is not likely, it is possible that this species existed there in the recent past. It is possible that the habitat could support CRLFs, but that for one of various reasons they are not there. The Terrestrial Biological Survey Report concludes that this is potential habitat.

Western spadefoot toad's geographic range extends through San Luis Obispo County. This toad is found in a diversity of habitats though always proximate to some body of water (temporary or seasonal). All of the northwestern and northeastern portions of the MBPP could potentially be used by spadefoot toads. Occurrence of toads within the tank farm is only likely if there is a large population of spadefoots in the habitats adjacent to MBPP. Aestivating toads would be most likely found close to the creek or seeps, though one cannot rule out their occurrence almost anywhere on the MBPP site. No specific survey was conducted for this species. No individuals of this species were observed in over 25 hours of observations in Morro Creek, and over 80 hours in upland habitats; however, this species is presumed present.

Southwestern Pond Turtle. California is home to only one species of turtle, though other species have been introduced and have done quite well (Schoenherr 1992). California's western pond turtle (*Clemmys marmorata*) is divided into two subspecies, a northern form and a southern form. *C. m. pallida* occurs in San Luis Obispo County. This is a largely aquatic turtle that utilizes the terrestrial environment to overwinter and to lay eggs (Stebbins 1966). Habitat requirements have been somewhat difficult to examine because they are relative generalists (Reese and Welsh 1998). They can inhabit streams, marshes and ponds. They appear to require a permanent source of water. Underwater refugia and protected basking sites are important habitat requirements. Substrates can vary from rocky to muddy. Basking sites will often be an exposed rock, vegetation mat, or log surrounded by water or mostly bordered by vegetation where they can easily slide into the water and take cover. Morro Creek is within the historical range of this species.

This species is known (CNDDB) to have occurred in the three creeks just to the North of Morro Creek. These three are Toro Creek, 2.5 miles north, Willow Creek, 3.8 miles north, and Old Creek 4.5 miles north. However, the last documented western pond turtles in these creeks were found in 1988. Morro Creek and portions of Willow Camp Creek represent potential habitat for this species.

Morro and Willow Camp creeks provide abundant potential habitat for these turtles. The riparian corridor is well developed in some places. Morro Creek in particular appears to provide the same types of turtle habitats as Toro, Willow and Old Creeks. Probably the single most important factor in rendering the habitat unsuitable would be the potentially intermittent nature of water flow (though this would be a common feature of all these creeks, and Toro Creek in particular). Also, it is possible that the narrowing of the channel that has occurred through efforts to manage the creek has increased water flow rates and inadvertently increased the removal rate of suitable basking sites.

Terrestrial Biological Species Survey - Surveys were conducted on 6 days between June 9 to 16, 2000. A transect was run up the center of Morro Creek's channel bed. The entire length of Morro Creek was walked from its outflow to Highway 1 on each census day. The channel was walked slowly in order to minimize disturbance to wildlife. Binoculars (8x40) were used to search ahead of the observer whenever a new vantage point was reached. The banks and shoreline, as well as any potential basking sites were inspected for the presence of turtles. Approximately 6 hours were spent conducting the surveys.

Secondary surveys were completed in the process of completing the census for California red-legged frogs. This survey included a daytime component of about 5 hours. During the survey for CRLFs, the banks were also searched for southwestern pond turtles. This survey requires a similar sort of effort since CRLFs and pond turtles can both be frightened into hiding.

No southwestern pond turtles were discovered in over 11 hours of searching in Morro Creek. Given that southwestern pond turtles occur in streams with similar ecology (i.e., Toro Creek) and in close proximity to Morro Creek, it was expected that pond turtles would occur at Morro Creek. It is possible that they are currently absent, but occupy the stream intermittently. Alternatively, it is possible that they are entirely absent due to modifications in the stream flow rates, or due to stream (or bank) degradation. Therefore, the species surveyors concluded that this is potential habitat.

Coast horned lizard: Listed by the state as a Species of Special Concern, the coast horned lizard, *Phrynosoma coronatum* , is a species that is found in California from the tip of Baja northward to the Sacramento Valley (Brattstrom 1997). This species has been found in various places in the county, including various localities around Morro Bay. Within its range it can be found in a variety of habitats that include coniferous forests and broadleaf woodland (Stebbins, 1966). Along the coast of California this lizard is often associated with shrublands and grasslands. In addition to being found in sandy washes, they are found in areas with a substrate of fine loose soil. Horned lizard diet consists of ants and other insects (Stebbins, 1966). In some regions of California it is thought that exotic ant species, that have displaced and reduced numbers of native ants, are unpalatable to horned lizards and reduced the lizard's abundance.

This lizard inhabits conditions similar to those on the borrow pit (SE portion of the MBPP) and the area west of the Tank Farm as well as the Den Dulk parcels. However, Dr. Andoli, the herpetologist at Cal Poly, believes that coast horned lizards may have disappeared from many of the places in which they were once found around San Luis Obispo. The nearest known localities for this species are the Morro Bay Sand Spit, and Los Osos (SE of the intersection of South Bay Blvd., and Santa Ysabel). No horned lizards were observed during field surveys, though its presence is presumed due to the presence of potential habitat and difficulty in detection. No specific survey was conducted for this species, though the species-specific survey applied to the California legless lizard (below) would help with detection of this species.

California legless lizard: The form of California legless lizard found in the San Luis Obispo area (*Anniella pulchra nigra*) is listed as a Species of Special Concern by the state. These lizards are adapted for burrowing in sandy or loamy soils and through leaf litter. As such, they spend much of their time underground or beneath duff. Legless lizards may be active on the surface at night, remaining in subsurface moisture horizons during the day. The movement of this small limbless lizard appears to be primarily determined by soil temperature and moisture gradients (Jennings and Hayes 1994). Their behavior can be characterized as desiccation avoidance. Preferred soil temperatures are in the range of 21-28C (Bury and Balgooyen 1976). This lizard can be found on the soil surface when the surface temperature is warm (>21C), or near the soil surface during periods of high activity (morning and evening) (Jennings and Hayes 1994). Outside of abiotic factors, the movement ecology of this species is not well understood. It appears that in the short term they exhibit high site fidelity.

This species is fairly common in sandy soils of Montaña de Oro State Park, Los Osos and Morro Bay, yet it is difficult to detect even when specific efforts are made to find it. No legless lizards have been observed during fieldwork. The MBPP lies within the historic range of *Anniella pulchra nigra*. The species is known from coastal dune scrub, and introduced ice plant habitats such as those which occur within and adjacent to the tank farm, including the Den Dulk parcels. The sandy soil on site (covering a large portion of the tank farm) is considered suitable for legless lizards. On site habitats are not recognizably different from habitats in which this species has been found in other areas bordering Morro Bay.

<u>Terrestrial Biological Species Survey</u> - A species-specific survey for *Anniella* was constrained by the potential presence of Morro Shoulderband snails. These species can co-occur within coastal sage scrub and both can be extremely difficult to locate during a survey. A survey for the legless lizard involves raking sandy substrates in search of the burrowing animals. The constraint is that surveys for legless lizards can result in the destruction of Morro shoulderband snail habitat. These lizards prey on insects and other invertebrates in the soil. The soil invertebrate fauna is often associated with vegetative food sources. These underground food sources are in turn associated with above ground plant cover. It is this cover that also provides habitat for Morro shoulderband snails. Surveys can be conducted in sandy areas without vegetation and there would be no destruction of potential snail habitat. Yet this forces all legless lizard surveys into habitats that are less than ideal

for the lizards. These lizards are known to be temperature and humidity sensitive. In the summer and fall it is unlikely they would be in open areas without any vegetative cover. Thus, the most appropriate survey for legless lizards would involve removing the vegetation cover in sample plots and raking the substrate below. This action in turn would destroy the shoulderband snail's habitat. Given this constraint, in order to not destroy potential Morro shoulderband snail habitat, the survey protocol was modified.

The CDFG has adopted no formal legless lizard survey protocol. As such, the protocol outlined below was designed to actively seek evidence for the presence of legless lizards, while minimizing the potential for impact due to the survey. Impacts were minimized both on legless lizards themselves and on Morro shoulderband snail habitat. The survey involved searching the sand substrate within the tank farm for legless lizards. The search was conducted by using rakes with 5 tines each 6 inch long and spaced at 2.0-inch intervals. Each rake samples a swath of substrate 8 inches wide and 6 inches deep. Grids were placed in suitable habitat and the entire grid was gently tilled using the rakes. Only barren sand, or sand sparsely covered with ice plant were tilled. The location and dimensions of each grid was documented. Appendix 5 to the Terrestrial Biological Survey (attached hereto as Appendix 6.6B-1) shows the approximate location of each grid.

This survey was conducted in two phases. Phase I (30 May 1999) covered habitat that was not considered suitable for Morro shoulderband dune snails. This non-suitable habitat was sandy soil with only sparse vegetation. Such habitat is probably not ideal for legless lizards, but was least in conflict with the preservation of potential dune snail habitat. Phase II (15 and 16 June 1999) was conducted following the survey for shoulderband snails and extended into greater vegetation cover, but still exclusive of shoulderband snail habitat. No suitable soil substrate was found in the containment of tank 5 and thus no grids were placed in that containment.

The tank farm was sampled with 11 grids (location mapped in Appendix 6.6B-1, Appendix 5). These grids sampled appropriate habitats in all but one of the tank containments (Tank 5). A total of 28,403 square feet were sampled (21,417 in Phase I and 6,986 in Phase II). This entire area was searched to a depth of 6 inches. No legless lizards were recovered in the entire survey. The Terrestrial Biological Survey concluded that, despite the fact that no legless lizards were found, it cannot be ruled out that the California legless lizard is present (at least in small numbers) at the tank farm, but it can be ruled out that they are common or abundant.

The two-striped garter snake has a geographic distribution from Monterey Bay into Northern Baja. This species is primarily aquatic. It is most common along streams, flooded ditches, or in the vicinity of almost any permanent source of water. It is most frequently found where streamside and streambed rocks are abundant areas where streams pass through chaparral, or oak and pine woodlands (Bartlett and Tennant 2000). This species (*Thamnophis hammondii*) was previously considered a subspecies of *Thamnophis couchii* .

Rocky stream bank areas or areas where Morro Creek crosses through oak woodland are all found on the section of creek East of Highway 1. No specific census was undertaken for this species. Its presence was presumed due to potentially suitable habitat. However, it was never observed in over

25 hours of observations along Morro Creek West of Highway 1, nor in 10 hours of observations along the creek East of Highway 1.

The common loon is an abundant winter transient and resident along coastal and fresh water bodies including Morro Bay. Wintering populations are not breeding populations. Breeding occurs in Northern North America near coniferous forest lake districts. It is a regular but rare (nonbreeding) resident along the coast in summer. Of all the loons in Morro Bay this is the most common. This bird forages mostly in open waters (rather than mudflats for example) and as such will likely be minimally disturbed in waters adjacent to MBPP. No specific survey was conducted for this species as its distribution is well documented.

The California brown pelican is a common late summer and fall bird in Coastal San Luis Obispo County. Preferred habitats include offshore islets (such as adjacent to Morro Rock), beaches, inshore waters (such as Morro Bay, and well-developed creek mouths) and offshore waters immediately adjacent to the coast. Feeding occurs mainly in shallow waters. Morro Bay residents would be post-breeding season visitors. Some birds use the temporary lagoons that can form at the mouth of Morro Creek. No specific survey was conducted for this species as its distribution is well documented.

Double-crested cormorants are known residents of inshore waters at Morro Bay. Morro Rock represents the primary breeding locality in this area. Morro Rock is an Ecological Preserve. This species is a year round resident, with population densities increasing during the non-breeding winter months (due to the southward migration of birds that breed to the north). No specific survey was conducted for this species as its distribution is well documented.

Great blue herons typically nests in colonies in the tops of large secluded snags or the tallest available live trees within a given area, often near shallow-water feeding areas (Zeiner et. al, 1990). This species is known to nest in the vicinity of Morro Bay. Nesting activity is known from the Fairbanks Heron Rookery site in Morro Bay State Park. Great blue herons are highly sensitive to human disturbance and have been known to abandon existing nests following significant disturbance (Zeiner et. al., 1990). The breeding colony is located about 1.7 miles from the MBPP. Nesting of great blue heron is not expected to occur on site. This "sit and wait" and ambush predator is common along the banks of Morro Bay, the mudflats and fresh water inlets. No specific survey was conducted for this species as its distribution is well documented.

The American bittern is a common winter visitor to coastal marshes that contain some Typha vegetation cover. They are also rare or irregular visitors to the Salicornia marshes of Morro Bay. Since this bird is mostly associated with fresh water and brackish water habitats, its most likely occurrence near the MBPP would be near the mouth of Morro Creek where some Typha are present. This habitat does not have extensive reed cover preferred by this species and thus at best it would be rare. No specific survey was conducted for this species as its distribution is well documented.

Sharp-shinned hawk: This accipiter is not commonly found around San Luis Obispo but does appear almost every year. Sharp-shins migrate into the area during the winter. On site, the preferred habitat would be the riparian corridor along Morro Creek and Willow Camp Creek. It might be expected on site occasionally. No specific survey was conducted for this species as its distribution is well documented.

Cooper's hawk: Cooper's hawks breed in a few places within San Luis Obispo County, mainly in oak woodlands. However, Cooper's hawks commonly winter in the County and might be expected to forage on parts of the MBPP property. This hawk is commonly seen around San Luis Obispo and can be tallied on most birding trips to Morro Bay. During the winter, Cooper's hawks are not as shy as during the breeding season, and sometimes they hunt for small birds in residential and industrial areas. Impacts through human disturbance may be reduced by habituation (so long as habitat is available). No specific survey was conducted for this species as its distribution is well documented.

Northern harrier is a common transient and winter visitor to San Luis Obispo County. Some birds are known to remain in the county during the summer breeding season. Nesting is restricted to areas along the Northern County coastline. Harriers are most commonly seen soaring and foraging over grassland and marsh habitats. These would include habitats adjacent to or on MBPP property. This species was not the focus of a specific survey since its distribution is well documented.

White-tailed kites are most common along the coastline from Morro Bay north, though it is possible to find them in many habitats near the coast. Populations do not seem to be migratory. Their changes in abundance during the year are generally attributed to "apparent changes" meaning that abundance probably remains constant, but activity patterns and frequency of observation changes. Sightings are least common during the summer breeding season given the strong site fidelity of nesting pairs. These birds are not abundant, but may be locally common when found in wintering flocks. The primary food items taken by white-tailed kites (voles and gophers) are known to occur at the MBPP, though these prey species appear to be most abundant in the barrow pit area and are likely rare near the Tank Farm. Gophers are also abundant in the Den Dulk parcels. This species was not the focus of a specific survey since its distribution is well documented.

Golden eagle tends to be most common in coastal areas north of Cayucos (starting 5-6 miles north of Morro Bay), though they may be encountered in almost any location (generally away from human disturbance). It is unlikely that any nesting pairs would be within a one-mile radius of the MBPP as these birds generally nest in more secluded areas. Hunting grounds could include areas adjacent to Morro Bay and the MBPP, but even this is rather unlikely. This species was not the focus of a specific survey since its distribution is well documented.

Peregrine falcons are fairly uncommon throughout the county and are generally found along coastal areas. Long-term nest use (over 15 years) has been recorded from Morro Rock, and Ecological Preserve. The Raptor Research Center (Santa Cruz) and other organizations have managed the reproductive effort of this pair. This is one of only a few sites within the county where nesting peregrines are consistently found. The pair that nests on Morro Rock tends to forage in areas south of the rock rather than near the rock itself. Migrants and winter transients augment wintering populations. This species was delisted August 25, 1999, although it is still managed and monitored. This species was not the focus of a specific survey since its distribution is well documented.

California black rail is a common species within restricted habitat types of Morro Bay. Abundance is greatest in *Salicornia* (pickleweed) marsh, as well as in tule and willow marsh areas as occur along Turri Road (adjacent to Morro Bay's southeastern inflow). Populations of breeding individuals appear to be restricted in distribution and include: Los Osos Creek, Chorro Creek, Sweet Springs, Shark Inlet and Morro Bay State Park. The shallow water and thick cover habitats preferred by this small bird do not occur within one-mile of MBPP, but are restricted mainly to inflow areas that feed the Bay. As a result, no specific survey was undertaken for this species.

California clapper rails are associated with saltwater tidal marshes. In Morro Bay they are known to use the pickleweed salt marsh and concentrate their foraging activities in tidal channels within pickleweed. These wetland areas typically have a low tide salinity of > 7,100 ppm. Both winter and breeding habitats are similar (Eddleman and Conway 1998). This subspecies (*R.l. obsoletus*) is known from San Francisco and San Pablo Bay. It has disappeared from Monterey and Tomales Bays. Another subspecies (*R. l. levipes*) is known to occur in separate salt marshes from Santa Barbara to San Diego Counties. The subspecies in Morro Bay is undetermined, and considered to have gone extinct in 1942 (Small 1994). The CNDDB lists the Morro Bay population as D.l. obsoletus and indicates it is a "possible breeding population." The nearest pickleweed salt marsh is approximately 2 miles from the MBPP.

Western snowy plovers are known to breed along the Morro Bay Sand Spit (across the harbor mouth from Morro Rock) and along the dune complex of Atascadero State Beach (also called Morro Strand) that extends North from Morro Rock. Both nesting beaches are within one mile of the MBPP. Of these two areas the Sand Spit has a higher density of nesting pairs. Winter birds are seen throughout the county along sandy beaches. Summer residents are more localized into breeding colonies. Nests, which are no more than a shallow scrape lined with bits of shell or stone, are easily disturbed by human activity. Snowy plovers are also known to be heavily impacted by coyotes and foxes where they overlap. The distribution of breeding western snowy plovers is well documented and no specific survey was conducted for this species.

A rather recent problem has been the western expansion of non-native red fox (see red for account below) into various habitats including coastal breeding sites of Snowy Plovers. Red foxes have been documented on the MBPP as a result of general wildlife surveys at the plant. The impacts of red fox predation have been well documented at Mugu Lagoon (Ventura County), Seal Beach National Wildlife Area (Orange County), Bolsa Chica Ecological Reserve (Orange County), Moss Landing Wildlife Area (Monterey County), and in San Francisco Bay (all Bay Area counties). Complete and up to date information regarding the history and current status of the red fox problem relative to snowy plovers is available from http://www.dfg.ca.gov/hcpb/redfoxbrochr.html, or from Ronald Jurek (Wildlife Biologist, California Dept. Fish and Game 916-654-4267).

California least terns are known breeders along the Morro Bay Sand Spit, though breeding has not occurred there in the recent past. They were not observed on the sand spit during the spring and summer of 2000 in spite of over 330 hours of nest activity monitoring (Jennifer Ellison B Cal Poly Graduate Student pers. comm.). The nest monitoring involved walking the entire length of the sand spit (in one direction) every 2-3 days from March through August. This survey was done in the course of monitoring Western snowy plover nesting success. Currently the closest breeding population occurs in the Guadalupe Dunes complex of Southern San Luis Obispo County and Northern Santa Barbara County. These birds require fairly undisturbed sandy beaches and dunes for nesting. It is possible they might nest along Atascadero State Beach, but there are no recent records of nesting there by least terns. Given they were not detected on the relatively undisturbed sand spit, it is extremely improbable that they would occur on Morro Strand Beach. There is currently no known nesting activity by least terns within one mile of the MBPP. Their presence was presumed as they are known to forage in Morro Bay and near shore waters.

Marbled murrelets are occasional transient or winter visitors in offshore waters. Winter populations on inshore waters from Morro Bay north occur regularly. Population densities vary dramatically from year to year at any one locality. Occurrence of this bird is generally limited to winter months. Foraging is done in calmer shallow waters such as those found in inlets and bays. No known nesting localities are reported from San Luis Obispo County. No focused efforts were aimed at documenting its presence since its habitat is well known.

Burrowing owl is a migratory non-game bird of management concern (MNBMC) for the federal government and the burrow sites are of special concern to the state (CSC). In an initial wildlife inventory survey of the MBPP a burrowing owl and burrow were discovered in the northwestern corner of the property adjacent to the containment for tank number 3. This preliminary survey was conducted the last week of January (1999) and thus identified the burrow as a wintering burrow. At that time, it was also considered possible that the burrow was a summer or breeding burrow.

Burrows are the center of burrowing owl lifestyle. The burrow provides shelter and a permanent nest site. Two types of burrows are recognized. Wintering burrows are used seasonally following migration from breeding sites. Breeding burrows are used either just during the breeding season (if associated with a migratory population) or for the entire year (if used by a nonmigratory population). Their diverse diet includes nocturnal as well as diurnal species of insects, small mammal and reptiles. During the breeding season diurnal foraging increases and is in large part possible due to the protection afforded by quick escape into a burrow. As such, the burrow provides the sort of cover and protection that is required by a predator that could occasionally become prey.

Burrowing owls are known to breed near the coast along northern San Luis Obispo County and into Southern Monterey County. In the southern portions of San Luis Obispo County, burrowing owls are generally considered migratory. They winter along the coast but breed inland. Exactly where this transition from resident to migratory population occurs is unclear, and whether this boundary is static or variable across years is also unclear. Further, north coast burrowing owls tend to not occur adjacent to active dunes and foredunes. Thus, when owls are resident breeders, the habitats they occupy are distinct (more upland) from the habitat at the MBPP. Given the uncertainty regarding the breeding status of the burrow at the MBPP an activity survey during the breeding season (roughly April 15-July 15) was required.

Within San Luis Obispo County this species is generally associated with interior habitats of the East County (Carrizo and Elkhorn Plains as well as the Cuyama Valley). Occurrence of this species along the coast is generally expected along the northern county coast and even then occurrence is rare. There are records of wintering burrowing owls near the MBPP (along the Sand Spit), and in Montaña de Oro State Park. In the past those burrows have been for winter use and nesting has not been documented.

The MBPP contains habitat suitable for burrowing owls. An active owl burrow was discovered in the last week of January 1999 (the location is shown in Figure 6.6B-2a and in Appendix 6 of Appendix 6.6B-1. The owl was observed outside of the burrow on one occasion. Because it was obvious that an owl was present, the burrow was not examined closely. The burrow was again evaluated on July 2 1999. At that time there was no sign of activity. The burrow entrance was searched for signs of pellets, prints, insect parts and feathers. The only sign of owl activity or occupation was an owl feather found within 1.5 feet of the burrow entrance. In July, the burrow did not seem active. A clear determination of wintering versus breeding status is required and thus, the CDFG Staff Report on Burrowing Owl Mitigation was consulted for an appropriate survey protocol. According to the CDFG survey protocol, the Project site and a 150-meter (approximately 500-ft.) buffer (where possible and appropriate, based on habitat) should be surveyed to assess the presence of burrowing owls and their habitat. The 150-meter "buffer zone" is surveyed to identify burrows and owls outside of the Project area which may be impacted indirectly by Project construction activities.

Terrestrial Biological Species Survey - The survey protocol employed was based entirely on the CDFG Staff Report on Burrowing Owl Mitigation. The entire Project site and a 150-meter buffer area extending from the tank farm were surveyed for the presence of burrowing owls and their habitat. A winter survey (last week in January 1999) identified suitable habitat and an occupied burrow. A nesting season survey was conducted on June 29, July 2-3 and July 5-6 1999. Details of the survey protocol are included in Appendix 6.6B-1.

In January 1999, a single burrowing owl was observed at a single burrow (see Figure 6.6B-2a and Appendix 6 in Appendix 6.6B-1 for the location of this burrow). The burrow was not inspected for signs of activity since it was obvious that at least one individual was using the burrow for wintering. The subsequent pedestrian survey conducted in June identified only a single owl burrow (the one previously identified) within the Project area and a 150-meter buffer zone. A large number of ground squirrel burrows are observed to be located throughout the area (see Appendix 6.6B-1, Appendix 6). Only one of these (the previously occupied site) appeared to have been enlarged into a burrowing owl burrow. On June 29, 1999 that single burrow did not appear active. There were no pellets, scats, insect parts or prints. The only evidence of occupation by burrowing owls was a single burrowing owl feather found adjacent to the entrance of the burrow. Since no signs of activity were observed, it is most likely that some occupant other than a burrowing owl brought up the feather from within.

Direct observations of the burrow for three hours (two prior and one following sunset) on each of four evenings in early July 1999 yielded no signs of burrowing owl activity. If an owl emerged from the burrow it would have been clearly visible. As such it must be concluded that either this burrow is used exclusively for wintering, it is used for breeding on some (but not this) years, or there was a breeding pair using the burrow and they have both been displaced. Evidence indicates that the burrow is at least a wintering burrow.

The observations of the MBPP burrowing owl burrow in the winter of 2000 (February) failed to produce any evidence of a burrowing owl. At least one other burrowing owl was in the Morro Bay area. This individual was present at Montaña de Oro State Park in March 2000. This same individual appeared to be absent by summer (July) of 2000. Taken together these data are consistent with a wintering burrowing owl population in appropriate habitats adjacent to Morro Bay. There is no evidence of a breeding population, nor is there evidence that the MBPP burrow site is used every year. As such, the MBPP represents suitable burrowing owl habitat some years and potential habitat in alternate years.

Willow Flycatchers are listed as state endangered and are rare but regular springtime transients, primarily in eastern San Luis Obispo County. This species is most common along the coast in the fall, though it is not ever really common. Most sightings are related to migration and occur at sites known to attract migrating flycatchers and insectivores. Sightings are rare but regular in the spring. During fall migration they are uncommon to common especially during September. There are no known records of nesting pairs in the county, though it is probable that they did nest in coastal areas of the county before this species suffered a population decline (beginning early in the century). Morro Creek is an attractive stop for insectivores and rare, but regular birds are often sighted there.

Habitats at the Morro Bay Power Plant, and Morro and Willow Camp Creeks include potential habitat for willow flycatcher. Willow flycatchers build their nests in deciduous trees and shrubs, primarily using willows. In the southern portions of their breeding range, suitable habitats are often associated with water (streams and marshes). The type of foraging and nesting habitats present along Morro and Willow Camp creeks are appropriate for willow flycatchers, though it is acknowledged that this locality is south of the currently recognized breeding range. At best this is potential habitat, though it may have been suitable in the past. During the spring of 2000 a species-specific survey was undertaken for breeding individuals.

<u>Terrestrial Biological Species Survey</u> - Surveys for willow flycatcher was done in two ways. First, all potential habitats were searched for visible individuals using 8x40 binoculars. Bird vocalizations were also used for species identification during this portion of the survey. The visual and acoustic surveys were done from within the creek bed of Morro Creek, and along the edges of the riparian habitat at Willow Camp Creek on seven days between June 9 – 16, 2000. Second, the presence of all four species was monitored using playbacks of recorded species-specific songs on July 14 and 16, 2000. These recordings came from the Peterson Field Guide, Western Bird Songs and were played on a portable battery powered Compact Disc player with two amplified speakers. Then the surrounding habitats are monitored for vocalization responses from the target species, or for individuals that emerge from cover to investigate the call of a foreign bird. Calls are broadcast for each species separately. Morro Creek was divided into multiple calling stations. Willow Camp Creek represented its own set of calling stations. To ensure one hundred percent coverage of the survey area, broadcasts were done at intervals of 30 to 40 meters. At these distances any two consecutive broadcasts would overlap. Each station was sampled in the following manner: the song of a species was broadcast several times from a station, monitoring for that species followed, the next species in the series would have its song broadcast several times, monitoring would follow, this would be continued through the series of four song types, then the entire series would be repeated for a total of three runs of a series per station. This protocol provided 100% acoustic coverage of the

entire riparian area and associated upland habitats. The weather during the entire survey period was warm, clear and sunny. Visibility was excellent. No willow flycatcher were found during the surveys. It is considered extremely unlikely that willow flycatchers would be present on site.

Loggerhead shrikes are a California Species of Special Concern. They are commonly found around the county in areas that contain grasslands or possibly a combination of upland and aquatic habitats. In other parts of the United States shrikes have declined, but in this area they are still common. They are often seen perched on fences by fields and pastures. This bird preys on insects and small birds, foraging over relatively open grasslands or in oak savannahs.

The loggerhead shrike is less common along the coast than it is in interior San Luis Obispo County. Along the coast it is uncommon to fairly common during winter, and very uncommon and localized during summer. Their highest coastal densities during the breeding season are along the North coast of San Luis Obispo County. This species is expected to occur most frequently in open grassland or Oak Savannah, and less frequently in coastal sage scrub.

There are several areas of potential habitat for loggerhead shrikes at the MBPP and associated with Morro Creek. The borrow pit in the southeast corner of the property contains the most open grassland area. There is some poorly developed coastal sage scrub there as well. To the south of Morro Creek, between Highway 1 and Highway 41, some remnant oak savannah is associated with agricultural development. Either of these localities represents potential habitat. There are also large grassland areas extending East of Highway 1 and away from the MBPP.

<u>Terrestrial Biological Species Survey</u> - An effort was made to document the presence of breeding loggerhead shrikes during the spring of 2000 following the protocols followed for willow flycatcher surveys. None were observed or heard and it is considered extremely unlikely that this species would be present on site.

Bank Swallows are listed as state threatened. They are uncommon within the county and are usually seen as migrants. This species generally forages and nests near fresh water (lakes, streams and rivers). There are no known current nesting sites within the county. Historical nesting sites are known from Morro Bay: a steep bank across the road from the Morro Bay Natural History Museum has signs of nests, but has not been utilized since 1941. This species is generally seen during migration. They are rare, but regular, visitors along the coast during mid-April to mid May, and again late August to mid-October. There are some small embankments along Morro Creek that represent potential bank swallow nest sites. Some of these are associated with the Highway 1 overpass. Several species of swallows were observed foraging over the water at Morro Creek. Thus, the Terrestrial Biological Survey concludes that there is suitable foraging habitat.

<u>Terrestrial Biological Species Survey</u> - An effort was made to document the presence of breeding bank swallows during the spring of 2000 using protocols described for willow flycatchers. None were observed or heard and it is considered extremely unlikely that this species would be present.

Yellow Warblers are a California Species of Special Concern. They are considered to be a habitat generalist and can be found breeding throughout much of the west, including San Luis Obispo

County (Schoenherr 1992 and Edell et al. 1996). These warblers can be found in second-growth woodland, gardens, scrub, and riparian thickets. They tend to breed most often in wet deciduous thickets (Dunn and Garrett 1997) especially willow or willow-cottonwood thickets. Willows, Salix spp., are a preferred choice for nesting sites (Lowther et al. 1999). Habitats used for spring breeding are also often used for fall migration. Yellow warblers are known to breed in early successional and disturbed habitats.

In San Luis Obispo County they can be encountered almost anywhere. The yellow warbler is a common breeder and summer resident in interior valleys and along coastal San Luis Obispo County. Their distribution as a breeding bird is generally localized. It is considered to be most common in warmer interior valleys and the counties south coast. Breeding habitats generally contain large willow riparian habitats or cottonwood-willow associations. Currently breeding birds are known from the Chorro Flats area (confluence of Chorro Creek into the northeastern portion of Morro Bay, Southeast of Morro Bay State Park).

Yellow warblers are one of the bird species most often parasitized by the brown-headed cowbird (Chapman 1907, Lowther et al. 1999). In a certain percentage of parasitized yellow warbler nests the egg of the cowbird is recognized and killed. Other predators that have been attributed to lowering yellow warbler populations are domestic cats and the American crow. In riparian areas that have been grazed, cleared, or have been continually sprayed with herbicide, yellow warblers fair poorly. In contrast when these practices cease yellow warbler populations increase along with the riparian vegetation (Ehrlich, Dobkin, and Wheye 1988).

<u>Terrestrial Biological Species Survey</u> - A species specific survey for this species was conducted for yellow warbler during the spring of 2000 using protocols as described for willow flycatcher. No breeding individuals were detected.

The Morro Bay Kangaroo Rat is a highly endangered and geographically restricted species. Since the mid-1980s the population has been estimated at 50 individuals or fewer. The entire population of this form is restricted to coastal scrub vegetation on the Southern edge of Morro Bay (Los Osos). Other potential habitat localities (that are currently unoccupied) include several small parcels east of Los Osos (near the Junior High School), north and south of Los Osos Valley Road to the east Los Osos, and possibly in Montaña de Oro State Park. The Terrestrial Biological Survey concludes that, due to its highly restricted distribution on the south and southeastern slopes bordering Morro Bay, it is unlikely any activity at MBPP would impact this species. The historical distribution of this subspecies is well documented. No species-specific survey was undertaken.

The Monterey dusky-footed wood rat (*Neotoma fuscipes luciana*) is a California Species of Special Concern. This species has a range that extends into northern San Luis Obispo County. This species is generally found in dense vegetation, thick shrubbery, and in oak woodlands. The Monterey dusky-footed woodrat (*N. fuscipes luciana*) occurs in a diversity of habitats within coastal San Luis Obispo County. It can be found in dense stands of Coastal Sage Scrub, chaparral, riparian woodland, oak woodland, and oak savannah. The riparian woodlands surrounding Morro and Willow Camp Creeks provide potential habitat for this species. The distribution if these two species in the Northern portion on Morro Bay is not well known. A species survey was conducted in order to determine if either species is present.

Their presence is usually determined through the observation of a woodrat house (packrat midden). In this species, the houses are piles of interlaced stick several feet in diameter. The houses afford protection and a place for the woodrat to hide. The house itself need not be hidden. It is expected that this species occurs in willow thickets or dense vegetation associated with Morro Creek, and Willow Camp creek, but not in the tank farm.

Terrestrial Biological Species Survey - Woodrats are difficult to detect unless one either live traps, or does a search for woodrat houses. Woodrat houses are fabricated from sticks and other debris that is collected and mounded into a structure. These structures can be several feet in diameter and several feet in height. In some habitats (e.g.: oak woodland) the houses are evident. In riparian habitats the woodrat houses are generally placed within dense vegetation. An effort to live trap was not undertaken since there were no other small mammals of concern at the study site. Since woodrat houses can be detected by a careful search through the vegetation this method was chosen instead of live trapping.

On June 8 2000, a 5-hour survey was conducted for woodrat houses. Access to the riparian habitats was primarily through Morro Creek (from its mouth to Highway 1). The vegetation along both banks was checked for any signs of woodrat houses. Wherever the vegetation allowed access (trails etc.), short excursions were made into heavier cover outside of the streambed. Again, care was taken to look thought the vegetation for any sign of a woodrat house. Willow Camp Creek was also examined with access through its channel. Willow Camp Creek was additionally evaluated from the upland side (east side of the creek). From the upland side, all access points into vegetation were taken. In all survey areas all unobstructed habitat was visually searched for woodrat houses.

No woodrat houses were observed by the surveyors in any of the riparian habitat. Generally the vegetation allowed unobstructed viewing from 5-25 feet into the riparian cover. Where the channel is wider (lower portion) visibility was better. German-ivy (*Senecio mikanioides*) has overgrown much of the native riparian vegetation in particular regions (adjacent to the tank farm for example). This introduced species made the search for woodrat houses problematic in these areas. Based on the results of the survey woodrats would have been presumed absent; however, during the course of the California red-legged frog survey, Biologist Julie Schneider observed a dusky-footed woodrat. She was monitoring the removal of vegetation beneath willows. As the vegetation was removed, a woodrat fled. She saw multiple characteristics allowing her to identify it to species (tail shape and length, body and tail color, and ear shape). This individual was clearly not a species in the genus Rattus. Subsequent to her discovery she examined the site for any evidence of a woodrat house. No structure was located. It is possible that this individual was foraging away from (rather than displaced from) its house. Alternatively, it is possible this was a dispersing subadult.

The San Diego Desert Woodrat (*Neotoma lepida intermedia*) is also a California Species of Special Concern. It is one of several subspecies of desert woodrat that occurs in California. This subspecies has a range that extends from Baja California into Northern San Luis Obispo County (Hall 1981). California's coastal sage scrub habitat harbors large populations of desert woodrats (Wilson and Ruff eds. 1999), especially in Southern California. Yet, relative to the dusky-footed woodrat the desert woodrat is associated with arid and semiarid conditions.

In San Luis Obispo County desert woodrats are restricted to rocky outcroppings. Occasionally, they extend out of these outcroppings into diverse plant communities, but only in association with patched of prickly pear cactus (*Opuntia*). Desert woodrats in coastal California are larger than interior woodrats. This species overall is larger than the dusky-footed woodrat. As such, they will generally displace dusky-footed woodrats from rocky outcroppings and cactus patches. Desert woodrats build complex stick nests either in crack and rock crevices, or in clumps of cactus. The desert woodrat's nest is made up of a collection of sticks, leaves and other debris that are placed in what seems to be a random fashion. Shiny objects such as pieces of metal or bone are often collected and placed on the nest. These stick piles are easily identified and are considered active if fresh green material is mixed in with older debris. Morro rock and Black Hill (East of Morro Bay State Park) would be the closest areas with potential habitat of rocky substrate. According to the Terrestrial Biological Survey, the authors are not aware of any cactus patches within one-mile of the MBPP. No species-specific survey was conducted for this species. It is presumed to occur on Morro Rock

Red fox from the Sierra Nevada of California are listed as a California state threatened species. This species is a high elevation fox (> 6,000 ft) that does not extend as far down as the Central Valley. The Central Valley in turn has its own population of red fox, which are not protected. The Central Valley fox derived from multiple independent introductions of game animals, and from accidental or intentional release from fox farms. The Central Valley fox is morphologically different form the endangered Sierran form (Roest 1977). A species-specific survey was completed (see below) in order to ascertain whether foxes seen on site are Sierran or Valley fox. During this survey a red fox was photographed at the MBPP (see Appendix 6.6B-1, Appendix 3). The Terrestrial Biological Survey concludes that the photographed individual is a Central Valley fox and as such is not protected but instead is a recognized pest species.

The CDFG has found red foxes to be a potential nuisance (consult http://www.dfg.ca.gov/hcpb/redfoxbrochr.html). This is because the fox poses a threat to important wildlife species, including threatened and endangered species throughout the state. Local species that could be impacted are: snowy plovers, least terns, clapper rails, and burrowing owls. Red foxes use much of the MBPP site. Signs and sightings occurred on all sides of the plant except immediately adjacent to the developed Embarcadero area.

Terrestrial Biological Species Survey - During 1999, photographs and field observations were made of red fox on an opportunistic basis. At that point, no specific survey has been conducted, but when foxes presented themselves, data was gathered to assist in providing a minimum estimate of the population size. All pertinent data include the number of foxes seen simultaneously, and morphological distinctions (individual identification) of foxes not seen simultaneously.

During the summer of 1999 a systematic survey was conducted at the MBPP to identify potential red fox den sites. This species generally constructs its den in a slope. Slopes on site were checked for presence of den openings. In addition, culverts were inspected for their use as den sites. During June of 2000 sites on the MBPP that had shown activity by foxes the previous year were checked to see if activity (presence) continued. In addition, the Den Dulk parcels and dunes just North of Morro Creek were also surveyed for signs of foxes. Fox activity can be distinguished from dog activity due a distinctive shape of the forward heal pad and the gait pattern in red foxes.

The MBPP has also been included in a predator census that involves habitats extending 12 miles north and 8 miles south of the plant. This census involved "calling" for predators using a predator call. The call simulates a rabbit in distress. Foxes are attracted to the potential prey (rabbit) and can be lured in close enough to illuminate with a hand held light so they can be identified to species.

At least five red foxes existed on site at the MBPP in 1999. Three of these foxes had been seen. A pair of "yellow" foxes was seen on June 29 at tank 5. A darker (likely juvenile) individual was likewise seen at tank 5 (July 2). In consultation with CDFG, three red foxes were removed from the MBPP during the summer of 1999. Following the removal potential den sites were monitored for activity. Two of the dens remained active. These two dens were at opposite ends of the MBPP and indicate that two foxes remained on site following fox removal efforts.

The systematic search for fox dens conducted in 1999 identified four separate den sites. Each den site can have multiple burrow openings. Foxes will use multiple dens within a den site in order to avoid the ectoparasite loads that build up within each den. This indicates that there were at least 4 family groups on site at the MBPP.

Foxes have been observed in all parts of the MBPP property including the borrow pit, access roads, and the tank farm. They are active adjacent to the tank farm in the Den Dulk parcels, dunes to the South and dunes to the North of Morro Creek. Based on the larger geographic survey for red foxes several small resident populations have been identified. A resident population is known from: MBPP, Morro Strand State Park, and Sweet Springs Ecological Preserve (Los Osos).

Southern sea otters are common inhabitants of the coastal and estuarine waters in and near Morro Bay. These marine mammals are generally found feeding or resting in kelp beds, near reefs, or in shallower calm inshore waters. See Section 6.6A for detailed discussion of this species.

6.6B.2 TERRESTRIAL BIOLOGICAL IMPACTS AND MITIGATION DESIGN FEATURES

This subsection evaluates potential impacts using significance criteria based on CEQA Guidelines, Appendix G, Environmental Checklist Form (approved January 1, 1999) and performance standards or thresholds adopted by responsible agencies. Using these standards, an impact may be considered significant if the Project results in:

- A substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.

- A substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS.
- A substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
- Substantial interference with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impedes the use of native wildlife nursery sites.
- A conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- A conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.

Applying these significance guidelines and pursuant to the CEQA Guidelines, potential impacts were evaluated using the following ratings:

No Impact: The proposed Project would not result in an impact.

Less than significant impact: The proposed Project would result in an impact, but at a level that is not considered significant.

Potentially significant mitigable impact: If mitigation measures are implemented, the impact can be reduced to a less than significant level.

Potentially significant impact: There is substantial evidence that the impact of the proposed Project may be significant and cannot be avoided or reduced to a less than significant level.

In each case below, proposed mitigating design features are included to address potential impacts where appropriate. Implementation of the proposed design features will either avoid the impacts completely or reduce all identified potential impacts to less-than-significant levels.

All impact discussions and mitigation measures are based on information concerning sensitive species and sensitive habitats provided in the Terrestrial Biological Survey, prepared by V.L. Holland and Francis Villablanca dated October, 2000 (attached as Appendix 6.6B-1) and on data obtained from analyses performed for other sections of this AFC. These other sections, in particular, include air quality, noise, and traffic.

6.6B.2.1 OVERVIEW OF POTENTIAL IMPACTS

The Project consists of three interrelated elements: the demolition of the on site fuel oil tank farm; the construction and operation of two new combined cycle units with an electrical generating capacity of 1200 mw; and the demolition of the existing power building and the three 450-foot tall stacks for Units 1-4.

The area of the proposed Project, with few exceptions which are discussed below, occurs within the footprint of the existing power plant site, which is already heavily disturbed industrial facility. The tank farm area of the Project site was designed as a fuel oil spill containment area. This containment area consists of five fuel oil tanks and a blending tank situated within 10- to 15-foot berms which were engineered to contain up to 100 percent of fuel oil from the tanks in the event of a discharge. MBPP ceased using fuel oil to power its boilers in the mid-1990s.

The Project also includes three additional activities which are discussed and analyzed in terms of potential impacts.

1. A bridge crossing Morro Creek is proposed for construction access (Figure 6.6B-2b). After the Project is constructed, the bridge will be available to the City of Morro Bay for use as a pedestrian/bicycle path. The bridge will be designed so that the abutments are not within the creek nor will they be in adjacent riparian habitat. Therefore, no permanent direct impacts to riparian habitat are attributable to the bridge. Mitigation is provided below for any potential temporary adverse impacts to riparian habitat.

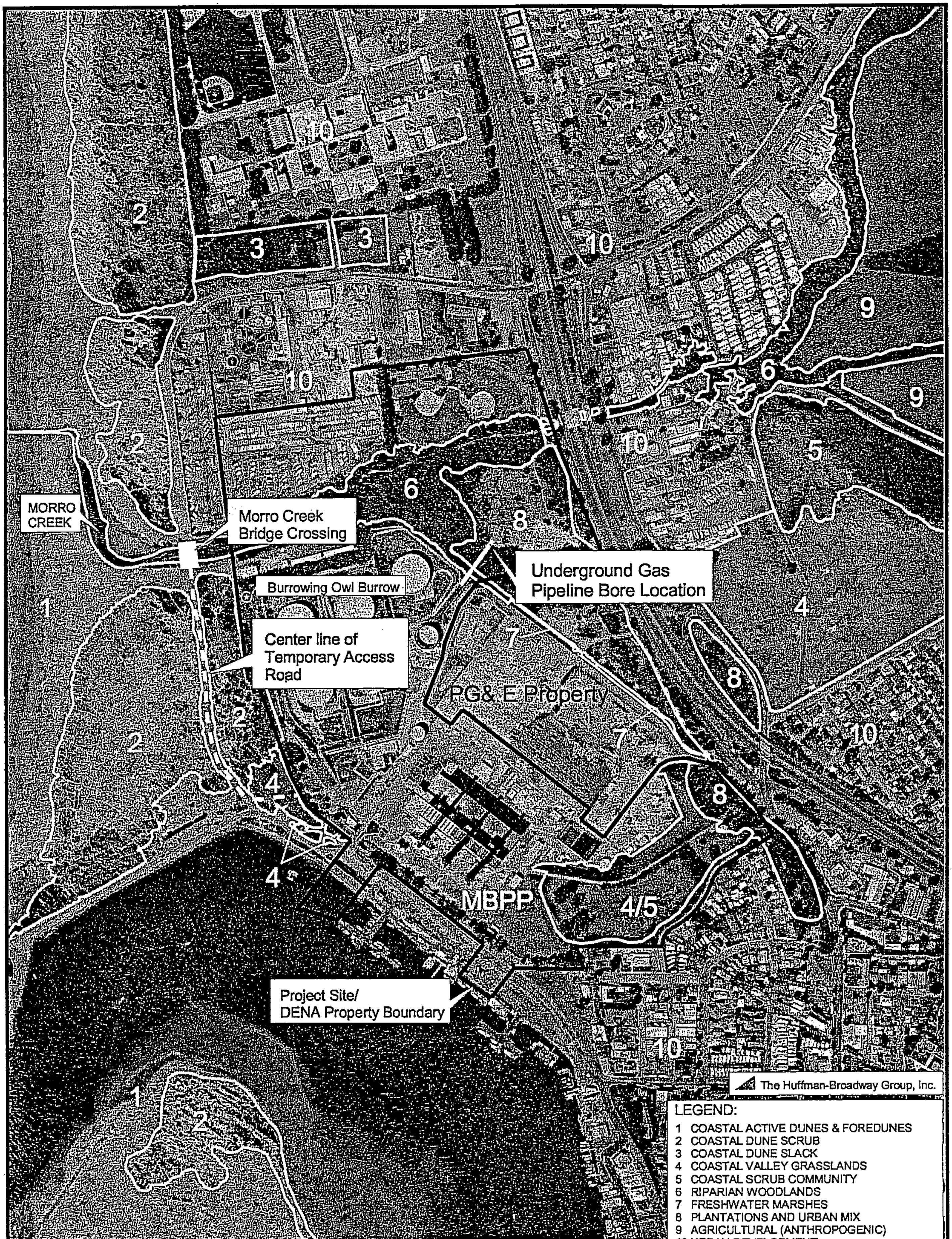

Figure 6.6B-2b Terrestrial Habitat Impacts Outside the MBPP

2. The Project includes the construction of one high pressure gas pipeline intertie to connect the modernized facility to the existing PG&E high pressure gas manifold system. This pipeline will be located underground by boring underneath Willow Camp Creek in order to prevent disturbance of the streambed and in order to prevent disruption of the riparian habitat (Figure 6.6B-2b). Boring equipment necessary to install the high pressure gas pipe intertie will avoid impacts to riparian habitat.

3. A temporary construction access road is proposed. The new construction road will be located such that it exits the MBPP property from the contractor's parking lot area (within the MBPP) about 450 feet northwest of the Main Gate; it will then cross City of Morro Bay property and connect to the existing extension of Embarcadero (Figure 6.6B-2b). Duke Energy proposes to re-align the Embarcadero in front of the MBPP such that the new alignment will be as depicted in the city's Waterfront Master Plan (May 28, 1996) and Waterfront Boardwalk and Circulation Improvements Project Feasibility Study (April 3, 2000). The portion of the re-aligned Embarcadero will be paved and routed to connect with future plans to relocate Coleman Drive behind Coleman Park as it directs traffic flow to Morro Rock. The extension of Embarcadero will direct Project vehicular traffic over an existing unpaved roadway (see Figure 6.6B-2b). This roadway will be improved for construction access by surfacing it with crushed aggregate and watering it for dust control. The construction road will lead to the new bridge crossing Morro Creek. The bridge will connect with the existing paved Embarcadero on the north side of Morro Creek. The new construction road will be designed to traverse disturbed grassland and will utilize an existing graded dirt road.

Duke Energy North America, LLC is evaluating the possibility of leasing one or more areas off-site to utilize as temporary construction laydown areas. The areas being evaluated are in San Luis Obispo County or a neighboring city within 20 miles of the Project. The criteria for site selection include an industrial zoning designation and history of use for parking or industrial storage/construction support. Additional criteria are discussed in Section 6.9. Since the laydown area(s) would be in areas previously utilized for parking or industrial storage/ construction support, no terrestrial biology impacts are anticipated and these potential laydown areas are not discussed further in this section.

6.6B.2.2 ENVIRONMENTAL IMPACTS AND MITIGATING DESIGN FEATURES

The following discussion evaluates potential impacts to sensitive habitats and special status wildlife species from construction and operation of the Project utilizing the significance criteria based on CEQA Guidelines stated above.

Pursuant to the CEQA Guidelines, a project's physical effects on the environment can be characterized as having either:

No impact: – The proposed Project would not result in an impact

Less-than-significant impact: – The proposed Project would result in an impact, but at a level that is not considered significant

Potentially significant mitigable impact: – If mitigation measures are implemented, the impact can be reduced to a less-than-significant level

Potentially significant impact: – There is substantial evidence that the impact of the proposed Project may be significant and cannot be avoided or reduced to a less-than significant level.

Implementation of the recommended mitigating design features will either avoid the impacts completely or reduce all identified impacts to less-than-significant levels. Implementation of mitigation design features will be ensured since they are expected to be incorporated as conditions of certification. The conditions of certification will include means of verification.

The discussion of potential impacts below has been organized to address each of the following six CEQA criteria questions:

1. Will the Project have a substantial adverse effect, either directly or through habitat modifications, or any species identified as a candidate, sensitive, or special status species in local or regional plans, policies or regulations, or by the CDFG or USFWS?

2. Will the Project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations, or by the CDFG or USFWS?

3. Will the Project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?

4. Will the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

5. Will the Project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

6. Will the Project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No "potentially significant impacts" were identified. Instead, any potential impacts are either "potentially significant mitigable impacts" or "less than significant impacts."

For each CEQA criterion question, potential impacts have been evaluated and mitigating design features identified where appropriate. In addition, as applicable, potential impacts are identified as construction or operational-related impacts.

Key mitigating design features that have been identified include:

- Qualified biological on site monitors during certain construction activities;
- Coastal Dune Scrub Restoration/Enhancement Plan;
- Exclusionary fencing or established exclusion zones for certain areas;
- Worker Environmental Awareness Program;
- Stormwater Pollution Prevention Plan;
- Erosion Control Plan;
- Continued agency coordination on fox removal program;
- Construction of a sound wall; and
- Directed and shielded lighting.

These features, as well as other specific measures are discussed in more detail below in connection with the relevant rated potential impacts.

<u>CEQA CRITERION 1</u>: Will the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

As set forth below, eight potentially significant mitigable construction-related impacts, and one potentially significant mitigable operational impact were identified. Design features which provide mitigation for each potential impact are included. In addition, five less than significant construction-related impacts, and three less than significant operational impacts were identified.

<u>Potentially Significant Mitigable Impacts (Construction-Related)</u>: Possible disturbance of the federally listed endangered Morro shoulderband snail and its potential habitat (coastal dune scrub) and the California legless lizard, a federal species of concern and a California species of special concern, and its habitat (coastal dune scrub), as a result of demolition and construction activities within the tank farm area. Potential disturbances include destruction of potential habitat or direct mortality from construction vehicles and equipment, if the species are present.

Discussion

The determination has been made that, although existing site conditions are already highly disturbed, vegetated areas of the tank farm represent potential habitat for the federally listed endangered Morro shoulderband snail and the federal and state special concern species, the California legless lizard. Species specific surveys were conducted and no individuals of either species were found, although it could not be ruled out that Morro shoulderband snails and California legless lizard are present (at least in small numbers). A definitive statement cannot be made about their presence or absence since the tank farm habitat was identified as potential habitat after the optimal time (during the rainy season, after rain events) within which protocol surveys are done. However, it is unlikely that they are present and they are certainly not common or abundant, given that the area does not have high quality wildlife habitat due to ongoing power plant operations.

Surveying for the California legless lizard is problematic since a survey could result in destruction of Morro shoulderband snail habitat. Vegetation removal to search for lizards could potentially destroy snail habitat. Where this species co-occurs or potentially co-occurs with Morro shoulderband snails surveys for legless lizards in the soil can only be conducted in areas that have no vegetative cover.

The impact to these two species is considered to be less-than-significant with the implementation of the mitigating design features listed below as part of the construction mitigation strategy for the proposed Project. The design features apply to both the Morro shoulderband snail and the California legless lizard. Informal consultation has been initiated with the Ventura office of the U.S. Fish and Wildlife Service and the following mitigation will be coordinated with the USFWS.

Mitigating Design Feature (a):

A qualified biologist will be retained to survey for the Morro shoulderband snail and the California legless lizard prior to disturbance of appropriate habitats associated with construction activities utilizing the following protocol:

- Two to four weeks prior to development, the vegetation at the entire site of potential habitat disturbance will be searched for Morro shoulderband snails. Any snails found will be immediately translocated to protected suitable habitat. Suitable translocation habitat would be determined in consultation with USFWS and CDFG.
- One to three weeks prior to development, immediately following the snail survey, all vegetation at the development site will be removed. A day after removal of vegetation, the soil will be raked in order to try and recover any legless lizards present. The raking will occur one day following vegetation removal in order to maximize locating the lizards.

As an alternative to the above, if a quantification of potential Morro shoulderband snail impact is required prior to implementing the above mitigation measure, a snail survey using USFWS protocol (Interim Survey Guidelines for the Morro shoulderband snail, 1977, http://www.r1.fws.gov.vfwo/surveyprot/morrosnail.htm could be conducted during the winter 2000-2001.

Mitigating Design Feature (b)

During grading, excavation and off-loading in coastal dune scrub, a qualified biological monitor will be on site in order to detect any legless lizards that are unearthed. Legless lizards that are discovered should be translocated to suitable habitat.

Mitigating Design Feature (c)

Implement a Coastal Dune Scrub Restoration/Enhancement Plan for impacts to potential habitat of the Morro shoulderband snail and the California legless lizard. Although the coastal dune scrub on the site of the tank farm is degraded, as well as being potential habitat for the two species discussed above, coastal dune scrub is listed as a sensitive habitat in the CNDDB.

A Coastal Dune Scrub Habitat Restoration/Enhancement Plan will be developed and implemented in an area of degraded coastal dune scrub west of the Project site. This plan includes removal of introduced beach grasses. The area will be revegetated with native dune species propagated from the vegetation from the disturbed sites or from the same species at adjacent sites. Monitoring of the restoration/enhancement area will be carried out over a period of 5 years with quantitative data collected on vegetation establishment and remedial actions proposed for areas not meeting established performance criteria.

Potentially Significant Mitigable Impact (Construction-related): Possible disturbance to non-federally or non-state listed special-status amphibians and reptiles and/or their potential habitat (western spadefoot toad, and coast horned lizard).

Discussion

The western spadefoot toad (a federal species of concern and California species of special concern), and the horned lizard (a federal species of concern and a California species of special concern) have the potential to occur in the coastal dune habitat or the tank farm. However, none of these species were observed on site.

Mitigating Design Feature (a):

Retain a qualified biologist who during the course of surveys for the Morro shoulderband snail and the California legless lizard would also monitor for the western spadefoot toad, and horned lizard. If found during surveys, individuals of these species will be translocated. The location of the translocation habitat would be determined in consultation with the USFWS and CDFG.

The Coastal Dune Scrub Restoration/Enhancement Plan, described above, will also mitigate for impacts to potential habitat of the above-mentioned species.

Potentially Significant Mitigable Impact (Construction-related): Possible disturbance to burrowing owl or its wintering burrow. The burrowing owl is a state and federal special concern species.

Discussion

A burrowing owl and burrow were observed on site (see Figure 6.6B-2a), however, the owl was not observed during the breeding season nor in consecutive winters. Observations have indicated this burrow is likely to be a winter burrow. Proposed Project components are not expected to directly impact the known burrow. Project activities could indirectly impact the burrowing owl through disruption at the burrow site related to adjacent construction activities. Project activities will have a less than significant impact on foraging habitat.

Impacts to the species could result if any of the following occur:

(1) Disturbance within 50 meters (approximately 160 ft.) which may result in harassment of owls at occupied burrows;

(2) Destruction of natural and artificial burrows (culverts, concrete slabs and debris piles that provide shelter to burrowing owls); and

(3) Destruction and/or degradation of foraging habitat adjacent (within 100m) of an occupied burrow(s).

Mitigating Design Feature (a):

Measures to mitigate potential impacts to the burrowing owl, the owl burrow and the encroachment into the 150 meter buffer zone around the known burrow will follow the CDFG staff report on burrowing owl mitigation, which follows:

Any mitigation actions should be taken prior to the nesting season (action from September 1 to January 31).

- Pre-construction surveys of the Project site and the 150-meter buffer zone will be conducted 30 days prior to construction to ensure that no additional burrowing owls have occupied the site since the previous survey. If ground disturbance activity is delayed for more than 30 days following a pre-construction survey, then the site and the buffer zone will be re-surveyed.
- If burrows are found, but will not be impacted, they will be fenced prior to construction to ensure construction vehicles do not impact burrow sites.
- If owls are found on the Project site in areas proposed for construction, owls cannot be translocated during the breeding season (February 1 – August 31) unless a qualified biologist (approved by the CDFG) verifies noninvasively that either: 1) the owls have

not begun egg-laying and incubating; 2) that juveniles have fledged, are foraging independently and are capable of independent survival.

- If the destruction of a burrow is unavoidable, then existing ground squirrel burrows will be enhanced (enlarged or cleared of debris). Alternative or enlarged burrows should be located at last 50 meters away from planned disturbance and in a protected area. A potential area currently exists along the fence line south of the burrow known to be utilized (see Appendix 6.6B-1, Appendix 6). The indicated area currently has three ground squirrel burrows. It is the closest, potentially suitable, protected area relative to the known burrowing owl burrow. These alternate burrows should be expanded according to CDFG approved burrowing owl construction protocol (CDFG Staff Report on Burrowing Owl Mitigation) in consultation with CDFG.
- If owls need to be moved away from disturbance areas and into modified or created burrows, then passive relocation techniques will be used rather than trapping. More than one week should be allowed to accomplish any relocation prior to the commencement of a project in order to allow the owls to acclimate to alternate burrows.

Potentially Significant Mitigable Impact (Construction-related): Disturbance to coastal dune scrub could potentially impact the Morro blue butterfly.

Discussion

The Morro blue butterfly is a federal species of concern known to occur in coastal dune scrub areas in the vicinity of the MBPP. It is almost always found in or in the vicinity of its host food plant *Lupinus chamissonis* (the silver beach lupine). Some silver beach lupines occur within the tank farm site. No individuals of this butterfly species were observed on the MBPP property or the adjacent Den Dulk parcels.

Mitigating Design Feature (a):

The Coastal Dune Scrub Restoration/Enhancement Plan, described above, will mitigate for potential impacts to the habitat of the Morro blue butterfly and utilize silver beach lupine as one of the native plant species proposed.

Potentially Significant Mitigable Impact (Construction-related): Construction traffic on the construction road planned to utilize the existing dirt road west of the tank farm could inadvertently injure wildlife species of the adjacent coastal dune scrub habitat.

Discussion

As described above.

Mitigating Design Feature (a):

An exclusionary fence should be constructed on both sides of the access road during its use by construction traffic in order to avoid injuring any sensitive wildlife species inhabiting the adjacent coastal dune scrub.

Mitigating Design Feature (b):

Duke Energy North America, LLC will develop and implement a Worker Environmental Awareness Program for construction employees and employees of contractors and subcontractors that may work in close proximity to areas specifically identified as sensitive habitats, such as coastal dune scrub and riparian habitats (see below).

- The worker environmental awareness program will consist of an on site or classroom presentation or video presentation. Supporting written material will also be provided;
- The program will discuss the locations and types of sensitive biological resources on the Project site and adjacent areas and reasons for protecting those resources;
- The program will discuss the various temporary and permanent habitat protection measures;
- The program will include information concerning a contact if there are comments and questions about the material discussed in the program.
- Each individual in the Worker Environmental Awareness Program will sign a statement indicating that they have received the training, and that they understand and will abide by the guidelines provided.

Potentially Significant Mitigable Impact (Construction-related): The proposed bridge over Morro Creek will be designed to avoid any impact to riparian vegetation or wetland and stream/riparian habitats. The bridge and bridge support structures will be placed outside of riparian habitat. Therefore, no direct impacts to the wetland or stream/riparian habitats or species utilizing the wetland and stream/riparian habitats of Morro Creek are expected. Similarly, no impacts are expected to special status species that are known to utilize the wetland and stream/riparian habitats at Willow Camp Creek or for which potential habitat exists in the wetland and stream/riparian areas. Inadvertent disruption in wetland and stream/riparian habitats could, however, result during construction of the bridge and placement of the gas pipeline.

Discussion

The sensitive species occurring or potentially occurring in the wetland and stream/riparian habitats include the steelhead trout, the Monterey dusky footed woodrat, California red-legged frog, willow flycatcher, bank swallow, yellow warbler, southwestern pond turtle, sharp shinned hawk, two-striped garter snake, western spadefoot toad, tidewater goby, and California newt. Of the twelve species, three are known or documented to be present in riparian areas adjacent to the power plant on the north or northeast: the steelhead trout (federally listed threatened and California listed endangered), Monterey dusky-footed woodrat (federal species of concern and California species of special concern), and the sharp shinned hawk (California species of special concern). Of the remaining nine species, five were surveyed for and were not found during surveys: the California red-legged frog (a federally listed threatened species), willow flycatcher (a state listed endangered species), bank swallow (a state listed threatened species), yellow warbler (a California species of special concern) and the southwestern pond turtle (a federal species of concern and California species of special concern); and four were deemed to be potentially present but have not been observed, the two striped garter snake (a California species of special concern) and the western spadefoot toad (federal species or concern and California species of special concern), the California newt (a California species of concern), and the tidewater goby (federally listed endangered and a California species of special concern).

Mitigating Design Feature (a):

Avoid inadvertent disruption in riparian and stream habitat that supports or potentially supports special status species by establishing and observing exclusion zones. Prior to construction, qualified biologists will stake and flag exclusion zones around riparian and stream areas. Construction related activities will be excluded from these zones. Foot travel will be permitted. The biologist will monitor construction activities near Morro Creek and Willow Camp Creek and associated wetland and stream/riparian habitats and will ensure barrier fencing and staking of sensitive habitat is in place and that sensitive species are not in the adjacent work areas.

Mitigating Design Feature (b):

Duke Energy North America, LLC will develop and implement a worker Environmental Awareness Program for construction employees and employees of contractors and subcontractors that may work in close proximity to areas specifically identified as sensitive habitats, including riparian habitats. The Worker Environmental Awareness Program is described in detail above.

Potentially Significant Mitigable Impact (Construction-related): Western snowy plovers known to breed along the Morro Bay Sand Spit and along the dune complex of Atascadero State Beach, within one-mile of the MBPP, could potentially be impacted by displacement of the red fox from the MBPP site onto breeding sites due to construction activities. Impacts could also be related to occupancy by fox of the MBPP site post-construction. They would then be in close proximity to breeding grounds.

Discussion

As set forth above.

Mitigating Design Feature (a):

Maintain an ongoing management effort to reduce fox populations at the MBPP due to their threat to special status wildlife species. In coordination with CDFG red foxes will be removed by Duke Energy, or its agents, from MBPP prior to construction activities and as an ongoing effort every six months. No additional mitigation required.

<u>Potentially Significant Mitigable Impact (Construction-related)</u>: Construction of the access road from the power plant and the construction road over the dirt pathway which runs west of the tank farm to Morro Creek, could potentially impact coastal dune scrub and sensitive species of this habitat.

<u>Discussion</u>

The route is proposed to traverse disturbed grassland and then join up with the existing dirt road, however, coastal dune scrub is adjacent to the grassland area and is adjacent to the existing dirt road and could potentially be impacted.

<u>Mitigating Design Feature (a):</u>

A qualified biologist will stake the route prior to road construction to ensure that it avoids mapped areas of coastal dune scrub.

<u>Less Than Significant Impact (Construction-related)</u>: The potential for sediment transport from upland sources to streams during construction could impact the steelhead trout, a federally listed threatened species known to occur in Morro Creek.

<u>Discussion</u>

The potential for sediment transport from upland sources to streams during construction will be reduced to a less-than-significant level since existing berms around the tank farm will prevent any sediment transport to streams during construction within the tank farm area.

<u>Mitigating Design Feature (a):</u>

All stormwater within the demolition and construction areas will be routed to the storm drain system and no drainage will be directed to Morro Creek or Willow Camp Creek. The Project will comply with the Stormwater Pollution Prevention Plan (SWPPP). An erosion control plan will be prepared to ensure that construction activities utilize best management practices and conform to applicable regulatory requirements. No additional mitigation measures required.

<u>Less Than Significant Impact (Construction-related)</u>: Possible disturbance of other special status species related to construction activities.

<u>Discussion</u>

Potential impacts to the following species are estimated to be less than significant, due to the lack of proximity of their habitats to the Project site, rarity of use of Project site, or lack of significant impact to their habitat: common loon, California brown pelican, double-crested cormorant, great blue heron, American bittern, golden eagle, peregrine falcon, California black rail, California clapper rail, marbled murrelet, Cooper's hawk, northern harrier, white-tailed kite, California least tern, Morro Bay kangaroo rat, San Diego wood rat, and southern sea otter. No design features or mitigation measures required.

Less-Than-Significant Impact (Construction-related): Construction noise could impact sensitive wildlife species.

Discussion

The results of the modeling for construction activities indicate that noise levels will be consistent with existing noise levels in the Morro Bay area (see Section 6.12). Some construction noise will be audible above normal Morro Bay commercial activities in the area; some will not. Utilizing a preliminary construction equipment list and assuming that 50 percent of the scheduled on site /monthly equipment was in simultaneous use during each phase of construction, modeling indicated that at some locations, including the Morro Dunes Trailer Park, construction noise would be increased by 4dB above ambient noise levels during the busiest period of construction activity (see Section 6.12). Noise levels at Morro Dunes Trailer Park are relevant to the biological analysis since the trailer park is north of Morro Creek and is utilized in this discussion as an approximation of impacts to wildlife species utilizing Morro Creek and its associated wetland and riparian habitats. These increases may be perceptible, but are not considered significant due to their temporary nature. At Morro Rock, the construction noise would be expected to be approximately 1dB above daytime ambient noise levels and would not be expected to result in a significant noise impact to wildlife species. These noise levels include the installation of piles that will support the main equipment and building foundations.

Mitigating Design Feature (a):

A special type of pile driving technique is proposed to reduce noise levels typically associated with this activity. The reduction in noise levels is 5 to 15 dB quieter than standard driving techniques. In general, construction noise levels were not found to be substantial and, given their limited duration, not significant. No further mitigation is required.

Less-Than-Significant-Impact (Construction-related): Impacts on air quality related to construction activity could effect special status wildlife species.

Discussion

As discussed in Appendix 6.2-5, to determine the potential worst-case daily construction impacts, exhaust and dust emission rates were evaluated for fugitive dust emissions resulting from construction of the Project and combustion emissions during construction. Since workforce and vehicle traffic during demolition would be lower than during construction, emissions from demolition would be lower than those from construction and are not discussed further. Design features to control exhaust emissions from the diesel heavy equipment and to control fugitive dust emissions are presented in Appendix 6.2-5. Ambient air quality impacts from emissions during construction of the Project were estimated using an air quality dispersion modeling analysis which considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust. The analysis indicates that with the exception of 24-hour and annual PM_{10} impacts, construction impacts alone for all modeled pollutants are expected to be below the most stringent state and national standards. However, the state 24-hour average PM_{10} standard is exceeded in the absence of the construction emissions for the Project. As evaluated in Appendix 6.2-5, the ISCST3 model overpredicts PM_{10} construction emission impacts due to the cold plume (i.e., ambient temperature) effect of dust emissions. Most of the plume dispersion characteristics in the ISCST3 model are derived from observations of hot plumes associated with typical smoke stacks. The ISCST3 model does compensate for plume temperature; however, for ambient temperature plumes the model assumes negligible buoyancy and dispersion. Consequently, the ambient concentrations in cold plumes remain high even at significant distances from a source. It has been evaluated in Appendix 6.2-5 that the Project construction site impacts are not unusual in comparison to most construction sites.

This impact is considered less than significant due to the evaluation made in Appendix 6.2-5 that the model has overestimated the PM_{10} impacts and the fact that all other modeled pollutants (NO_2, SO_2 and CO) are expected to be below the most stringent state and natural standards, as well as the temporary nature of the impact.

<u>Mitigating Design Features</u>

Design features for air quality impacts during construction can be found in Appendix 6.2-5.

<u>Less-Than-Significant Impact (Construction-related)</u>: Construction traffic related to the Morro Creek bridge crossing could disrupt special status wildlife species utilizing the adjacent wetland and stream/riparian habitats along Morro Creek and Willow Camp Creeks.

<u>Discussion</u>

The impact from actual construction of the bridge will be minimal and short term. The bridge is prefabricated and will be designed so that abutments are set back from the creek.

The Project proposes the construction of a new bridge across Morro Creek. The new bridge will be used for Project construction delivery traffic and for construction worker egress from the Project site. Upon completion of Project construction, the new bridge will be available to the City of Morro Bay for use as a pedestrian/bike path. On occasion during future operations, the bridge may be used to allow access for large equipment. The bridge access area (Embarcadero Road extension) is currently traveled by a small number of vehicles each day. Human presence consists mostly of people who travel to the area to use the beach for recreation. After completion of construction of the bridge, an increase in daily vehicular traffic in the area will occur, related to employee vehicles, construction equipment, and material deliveries, especially during the period between approximately 5:30 and 6:30 p.m. when site construction workers will depart to go home (morning access is through a different gate). See Section 6.11 for a complete discussion related to traffic and transportation.

Impacts to wildlife from this activity will consist of the presence of more vehicles which could potentially cause temporary departure from the area by wildlife if they are disturbed due to the vehicular traffic. It is anticipated, however, that wildlife species utilizing this area are already somewhat acclimated to human disturbance due to vehicular traffic. If disturbed, wildlife would be expected to utilize adjacent areas of Morro Creek further from the vehicular activity. It is anticipated in a worst case analysis that during the highest staffing levels during Stage II of construction (construction of the new power generation units) during peak hour, approximately 500 cars would be traveling over the bridge at the end of the day shift. During this same peak period of construction, approximately 150 cars that have arrived at 7:00 p.m. at the MBPP "back gate" would be departing from either the "back gate" or over the bridge. It is estimated that over the first 3 months, during Stage II, there would be an average of about 30 truck trips per day (15 deliveries) with a peak of up to 50 deliveries on a few busy days. After the initial 3 months of construction, this number would fall to an average of about four truck trips (2 deliveries) per day for the remaining 18 months of Stage II, though occasionally, up to 30 truck deliveries would occur on busy days (Chris Cannon, telephone communication). Since these impacts will only last through the construction period, and more specifically since employee vehicle use of the bridge area would be confined to an approximate one hour time period, this impact is considered less than significant. The impact of construction deliveries is also expected to be less than significant due to its temporary nature, with most delivery trips being concentrated within the 3-month period within Stage II of construction.

Similarly the impact at Willow Camp Creek related to construction traffic is considered less-than-significant. During the same peak period of construction described above, during peak hour, approximately 500 cars would be arriving at the back gate and traveling on a road adjacent to Willow Camp Creek (see Section 6.11 for details). Willow Camp Creek in this area provides some foraging habitat for wading birds. Due to the temporary nature of the construction impacts and the short time span within which construction workers will arrive, this is considered a less-than-significant impact.

<u>Potentially Significant Mitigable Impact (Operations-related)</u>: Light emitted from the Project site could potentially impact sensitive species.

<u>Discussion</u>

<u>The outdoor lighting level at Morro Creek is relevant to the biological analysis because a key area of biological concern related to Project operations is related to potential impacts to wildlife populations in coast dune scrub habitat and wetland and stream/riparian habitats found along Morro Creek and Willow Camp Creek.</u>

<u>Mitigating Design Feature (a):</u>

To the maximum extent feasible, while ensuring adequate illumination for the safety of workers, outdoor lighting will be shielded and down directed to direct light away from wetland and stream/riparian and coastal dune scrub habitats, and minimize upward glare.

<u>Less-Than Significant Impact (Operations-related)</u>: Operations noise levels are projected to have a less-than significant impact on sensitive wildlife species occurring in the riparian habitat of Morro Creek.

<u>Discussion</u>

Overall, modernization should yield a decrease in the amount of noise the plant produces. Yet, relative to the riparian habitats, noise will increase because the new units will be closer to the creek than the existing units. There are three evaluations of a noise impact to wildlife: (1) volume, (2) the sound's frequency, and (3) duration. With regard to frequency even a low decibel sound can have a negative impact if it is a particular frequency. An example could be sounds at the same frequency, that individuals of a species use to locate or attract individuals of the opposite sex. From a frequency perspective, there are probably few development-related sounds that do not have some negative impact. For example male yellow warblers sing to attract females and defend a territory. The male frequency range is approximately 3-8 kHz with the greatest concentration of power in the range of 4.5-5.5 kHz (Lowther 1999). The song of loggerhead shrikes serves a similar role. Male calls are in the approximate frequency range of 1-9 kHz (Reuven 1996). Given the amphibian and avian diversity expected in Morro Creek, it is likely that most frequencies could have a negative impact at some time of the year. Vocalizations in most birds are concentrated in the dawn and dusk hours with most of the singing occurring during dawn. In amphibians, most of the vocalizations are produced at night starting at or after dusk and ending before dawn. Impacts would be minimized if on site sound production were concentrated into daylight hours. Impacts would be maximized if high decibel and variable frequency sounds were produced at dawn or overnight. Likewise, impacts would be minimized if noise was produced during the fall and winter, and would be maximized if produced in the late winter, spring, and early summer (breeding seasons).

The noise level at Morro Creek is relevant to the biological analysis because a key area of biological concern related to Project operations is related to potential impacts to wildlife populations in Morro Creek and associated wetland and stream/riparian habitats. Analysis has indicated that existing noise levels as measured at Morro Creek are from 40-43 dBA (telephone communication, Bob Mason, October, 2000)

<u>Mitigating Design Feature</u>

A 20-foot sound wall is proposed to be constructed on the top of the northern berm of the tank farm, south of Morro Creek and the fisherman's gear storage facilities, in order to reduce noise impacts of the Project. Analyses indicate that noise levels in the Morro Creek area with implementation of the Project, and including the sound wall, are estimated to be between 45-50 dBA (telephone communication, Bob Mason, October 2000). From the standpoint of impacts to wildlife populations along the creek, including the potential presence of breeding birds, a project noise environment of 45-50 dBA would not generally be considered a level that would create significant wildlife impacts. Projected noise levels, though raised above ambient levels, would be elevated to levels typical to those encountered in most urban environments, and would not be expected to cause significant disruptions in wildlife usage in the area.

<u>Less-Than-Significant Impact (Operations-related)</u>: Air quality impacts to biological resources are anticipated to be less-than-significant.

<u>Discussion</u>

Modeling of air quality emissions (see Section 6.2) show that the addition of the new turbines at MBPP will not cause or contribute to violations of any state or federal air quality standards, with the exception of the state PM_{10} standard. For PM_{10}, existing concentrations already exceed the state standard, and it was determined that the proposed Project will result in a cumulative impact that is below PSD significance levels. The Project will result in net reductions in NO_x, VOC, and CO emissions. The increase in emissions of SO_2 from the facility will be below the 40 ton per year threshold, so will not be significant.

The modeling results show that the PSD significance levels for air quality impacts in Class II areas are exceeded for NOx, SO_2, one-hour CO, and annual PM_{10} only on Morro Rock. Morro Rock is of concern as a location for breeding populations of peregrine falcon and double-crested cormorant. It should be pointed out that the worst case scenario modeling analysis does not account for the reductions in ambient concentrations that will occur from the shutdown of existing Units 1 through 4 at MBPP, or for the ambient reductions that will occur from the additional PM_{10} and PM_{10} precursor offsets that will be provided.

Because of these considerations, no significant impacts to these species are expected due to changes in air quality at Morro Rock. Because the Project is expected to result in net reductions of NO_x emissions, deleterious air quality effects to species of rare plants known to occur in the vicinity of the MBPP would not be considered significant.

<u>Less-Than-Significant Impact (Operations-related)</u>: Stormwater drainage impacts to biological resources are anticipated to be less-than-significant.

Stormwater drainage will not be routed to either Morro Creek or Willow Camp Creek, therefore no impacts are anticipated to biological resources of either of these creeks as a result of stormwater drainage during operations.

<u>CEQA CRITERION 2</u>: Will the Project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

As set forth below, one potentially significant mitigable construction-related impact was identified. Design features for that potential impact are included. In addition, four less than significant construction-related impacts were identified.

<u>Potentially Significant Mitigable Impact (Construction-related)</u>: Coastal dune scrub, which is a sensitive habitat as listed in the CNDDB, occurs in a degraded form within the tank farm area which will be impacted by demolition and construction within the tank farm.

<u>Discussion</u>

This habitat is discussed above in relation to sensitive species.

<u>Mitigating Design Feature (a):</u>

Minimize impacts to coastal dune scrub where feasible. A Coastal Dune Scrub Restoration/Enhancement Plan will be implemented (see above description).

<u>Less-Than-Significant-Impacts (Construction-related)</u>: Riparian habitat will not be directly impacted by Project activities.

<u>Discussion</u>

See above discussion relating to wetland and stream/riparian habitats.

<u>Mitigating Design Features:</u>

Design features for potential indirect impacts to wetland and stream/riparian habitats are listed above.

Less-Than-Significant Impact: The City of Morro Bay's General Plan (GP) and Local Coastal Program (LCP) contain policies that relate to protecting biological resources in Morro Bay. Wetlands and stream/riparian habitats are considered Environmentally Sensitive Habitats under the LCP.

<u>Discussion</u>

The City of Morro Bay's LCP requires a minimum of a 50-foot buffer surrounding stream zones in urban areas. This buffer may be reduced to 25 feet under certain circumstances in consultation with USFWS and CDFG. The LCP indicates that bridges, when support structures are located outside of critical habitat areas, may be permitted in stream corridors when no alternative route/location is feasible (LCP Policy 11.15/GP Program LU-55.10). The bridge across Morro Creek will be constructed so that it avoids impacting wetland and stream/riparian habitats. Support structures will also not occur in wetland or stream/riparian habitats. The proposed bridge will span the wetland and stream/riparian habitats, but structures will not be placed within the habitat. Support structures will however be necessary within the buffer zone. The LCP indicates however, that this may be an allowed use within a buffer area. The City of Morro Bay's Municipal Code 17.40.040 ESH Overlay Zone also indicates that bridges are an allowable use within the stream corridor with a conditional use permit. The gas pipeline intertie will be bored underneath Willow Camp Creek and will not impact wetland or stream/riparian habitat. Therefore, the pipeline is consistent with General Plan and LCP policies.

<u>Less-Than-Significant Impact (Construction-related)</u>: The City of Morro Bay's General Plan and Local Coastal Program indicate that dune habitat is considered an environmentally sensitive habitat.

<u>Discussion</u>

The LCP requires a minimum buffer of 50 feet from dune (coastal dune scrub) habitat in urban areas. The LCP indicates that "any expansion of the PG&E power plant shall give priority to the options that would best utilize available on site space. Additionally, no dune areas should be disrupted unless there is no other less environmentally damaging alternative. PG&E shall contribute to the dunes stabilization program and reimburse their pro-rata share of any Coastal Conservancy (or city) expenditure for dune stabilization in this area" (LCP Policy 5.20/GP Policy LU-40.15).

The LCP specifically contemplates and permits the use of Dune areas for power plant operations. The modernization of the power plant in utilizing available on site space currently in use for power plant equipment is consistent with the LCP. In addition, the currently proposed construction access road alignment will follow an existing dirt road through the coastal dune scrub, then will enter the plant traversing degraded grassland habitat with a less than significant impact. As stated in a previous mitigation design feature a qualified biologist will assist in the staking of the alignment to ensure coastal dune scrub habitat is not impacted. Motorized vehicles will be confined to the construction road. Impacts to coastal dune scrub vegetation will occur on the site of the tank farm since the original tank farm was constructed in dune habitat. Dune vegetation has become reestablished within the sandy catchment basins which surround the tanks. Although degraded, certain sensitive wildlife species could potentially utilize the habitat. However, since the modernization, which impacts only degraded dune scrub vegetation/habitat, is occurring within the original footprint of the power plant which is consistent with the LCP policy, this impact is considered to be in compliance with the LCP.

<u>CEQA CRITERION 3</u>: Will the Project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?

No identified impacts. A wetland jurisdiction report is included as Appendix 6.6B-3. Wetlands and other Waters of the United States potentially under the jurisdiction of the Corps are shown in Figure 6.6B-3.

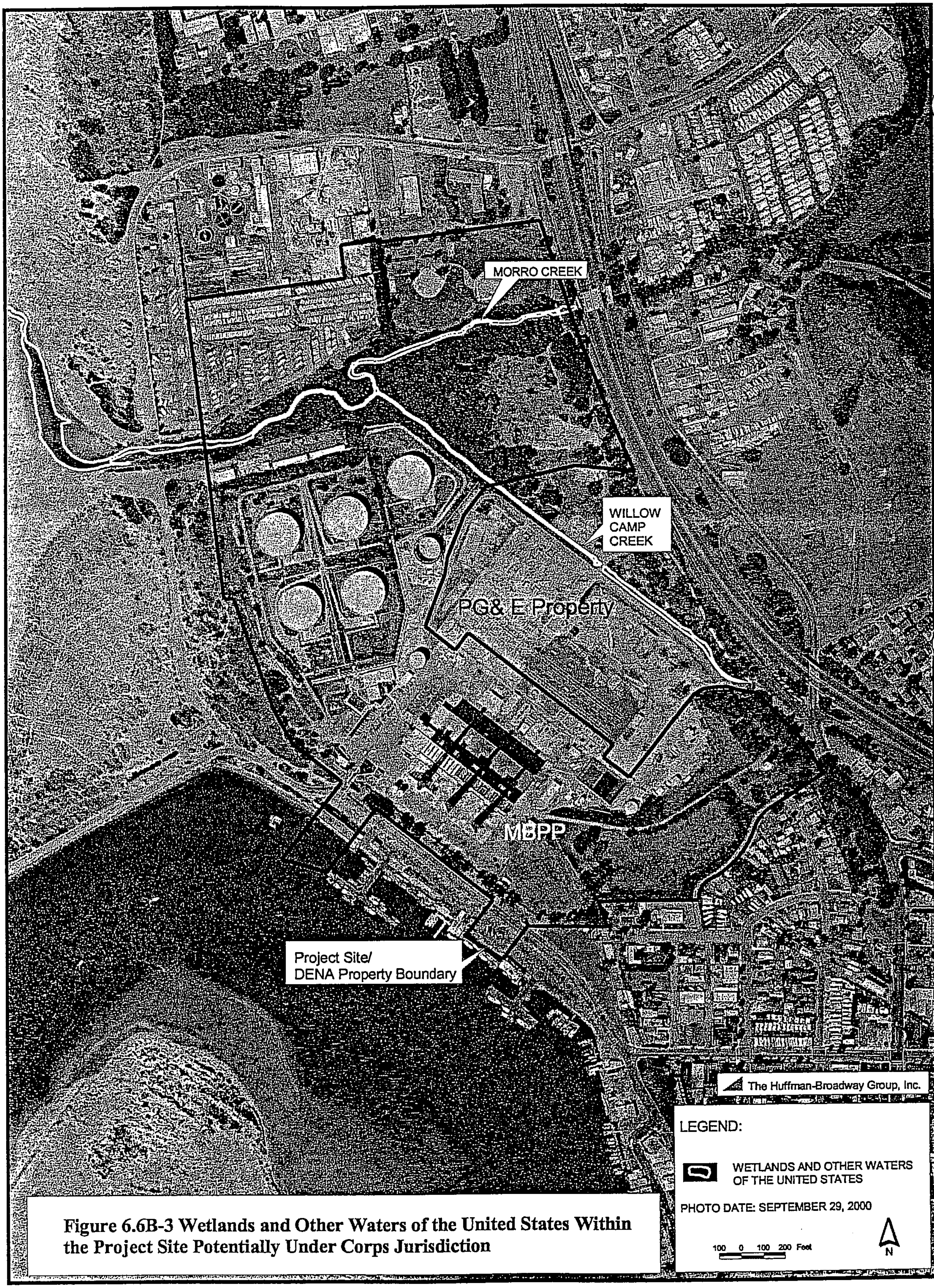

Figure 6.6B-3 Wetlands and Other Waters of the United States Within the Project Site Potentially Under Corps Jurisdiction

<u>CEQA CRITERION 4</u>: Will the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

No identified impacts.

<u>CEQA CRITERION 5:</u> Will the Project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinances?

No identified impacts.

<u>CEQA CRITERION 6</u>: Will the Project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

The Project will not conflict with local regional or state plans. No known habitat conservation plans exist that will be impacted by the Project. The Project, through the implementation of the recommended mitigation measures, will either avoid impacts to sensitive species and habitats completely or reduce all identified impacts to less-than-significant levels.

6.6B.2.3 IMPACTS TO WILDLIFE SPECIES OF COMMERCIAL/RECREATIONAL VALUE

There are no terrestrial wildlife species of commercial/recreational value that would be affected by the Project.

6.6B.2.4 CUMULATIVE IMPACTS

Cumulative impacts are impacts which are individually or incrementally minor, but which, when combined with impacts associated with past and present approved projects or other reasonably anticipated future projects, accumulate to more substantial proportions. CEQA states that cumulative impacts shall be discussed when they are significant and that the discussions shall describe the severity of the impacts and the likelihood of their occurrence. The process used to identify the projects for the cumulative analysis and the list of projects within the City of Morro Bay and within San Luis Obispo County considered in the cumulative analysis can be found in Section

6.1.4. From the list of City of Morro Bay projects provided in Section 6.1.4, the Cloisters Project was evaluated as being the most relevant in terms of consideration of cumulative terrestrial biological impacts related to the MBPP Project due to its proximity to the MBPP Project.

The Cloisters Housing Tract is a 120-unit housing project located north of MBPP along Morro Strand State Beach. The Cloisters project was approved and the public improvements and 25 percent of the residential units have been constructed. Review of The Cloisters Conceptual Plan and Tentative Map Description Materials (RRM Design Group, June 27, 1990) indicates that the defined Environmentally Sensitive Habitat Area (dunes) occurring on site in the amount of 21.6 acres along the western frontage of the site, are proposed to be dedicated to the State of California and are proposed to be protected by a 50-foot-wide buffer strip.

The Project EIR (Earth Metrics, Inc., 1991) indicates that construction of the Cloisters Project would result in loss of silver beach lupines occurring outside of the Environmentally Sensitive Habitat Area. Silver beach lupine is the host plant for the Morro blue butterfly. A silver beach lupine revegetation plan was proposed as mitigation, as part of an overall restoration/enhancement/protection program for the dune area, which would result in an overall benefit to the habitat.

The MBPP Project has been evaluated as impacting small areas of degraded coastal dune scrub vegetation, including silver beach lupine, within the tank farm area. A Coastal Dune Scrub Restoration/Enhancement Plan is proposed for an area west of the tank farm as mitigation. This enhancement plan would also include revegetation with silver beach lupine.

Although no Morro blue butterfly were located on the MBPP site, The Coastal Dune Scrub Restoration/Enhancement Plan would provide additional potential habitat for this species, as well as generally increasing the habitat value of the coastal dune scrub within the enhancement area. Since the MBPP Project does not have any significant unmitigable impacts to coastal dune scrub habitat and since both the MBPP Project and the Cloisters Project propose coastal dune scrub enhancement plans, no adverse additive effect of impacts to coastal dune scrub will occur nor are cumulative impacts expected to occur to other terrestrial biology resources as a result of the MBPP Project and other City of Morro Bay projects identified in Section 6.1.4.

Similarly, the following relevant County projects identified in Section 6.1.4 for which the County had information were reviewed for the potential that, when considered together with the Project, cumulative impacts in the region could result. Information concerning project impacts was supplied by the San Luis Obispo County Planning Department (Wier, 2000).

- San Luis Obispo County Airport Expansion – This project which includes a runway expansion and new terminal expansion with additional gates had no impacts to coastal dune scrub, although impacts to riparian habitat include 0.44 acre of willow scrub, 0.27 acre of freshwater marsh and 0.17 acre of "other waters of the United States".
- Woodlands Development – This project which includes residential development, business park, resort hotel and golf course is proposed to impact approximately 9

acres of "central coastal scrub" which would be replaced as mitigation.

- Cypress Ridge Residential Development – This 384-lot residential subdivision on Nipomo Mesa was identified as having indirect mitigable impacts to riparian habitat and mitigable impacts to coastal dune scrub.

- Guadalupe Oil Field Cleanup – This project, which is primarily an earth moving project, had identified significant and unavoidable impacts to dune scrub and riparian habitat.

- MCI Worldcom Project – The County has indicated that this project has inadvertently resulted in impacts to a small area of coastal dune scrub (approximately 200 square feet).

- Southern California Water Company Water Wells – This project, which has been permitted after the fact, is located off South Bay Boulevard in Los Osos. The project includes the construction of an access road and water wells. The County has indicated that construction had resulted in some take of the Morro shoulderband snail.

It has been evaluated that since the MBPP Project does not have any identified direct or significant indirect impacts to riparian habitat nor any significant unmitigable impacts to coastal dune scrub habitat and since the MBPP Project proposes a coastal dune scrub enhancement plan, no adverse additive effect of impacts to riparian or coastal dune scrub habitats, or sensitive species within these habitats, will occur; nor are cumulative impacts expected to occur to other terrestrial biology resources as a result of the MBPP Project and County projects evaluated.

6.6B.2.5 TERRESTRIAL BIOLOGY SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

There are no evaluated terrestrial biology significant unavoidable adverse impacts. All identified impacts and potential impacts are mitigable.

6.6B.3 LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS) COMPLIANCE

The MBPP Project site and temporary access route are located within the general geographic range of sensitive plant communities/habitats and special-status plant and wildlife species. Associated biological resources fall under the jurisdiction of the various local, state and federal agencies described below. With the previously described design feature the Project is expected to be in compliance with all applicable laws, regulations and standards.

6.6B.3.1 FEDERAL ENDANGERED SPECIES ACT

The U.S. Fish and Wildlife Service (USFWS) has jurisdiction over species that are formally listed as threatened or endangered under the Federal Endangered Species Act (FESA). The FESA protects listed wildlife species from harm or "take." The term "take" is broadly defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." The USFWS interprets "harm" to include "significant habitat modification or degradation that actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR Section 17.3). Since the FESA does not define "habitat" the USFWS defines it to include not only areas actually occupied by a species, but also areas that would be suitable for the species. An activity is defined as a "take" even if it is unintentional or accidental.

Section 9 of the FESA and its applicable regulations restrict certain activities with respect to endangered and threatened plants. However, these restrictions are less stringent than those applicable to fish and wildlife species. The provisions prohibit the removal of, malicious damage to, or destruction of any listed plant species "from areas under federal jurisdiction." In addition, listed plants may not be cut, dug up, damaged or destroyed, or removed from any other area (including private lands) in knowing violation of a state law or regulation.[1]

An endangered plant or wildlife species is one that is considered in danger of becoming extinct throughout all, or a significant portion of its range. A threatened species is one that is likely to become endangered within the foreseeable future. In addition to endangered and threatened species, which are legally protected under the FESA, the USFWS has a list of candidate species. A candidate species is one for which the USFWS currently has enough information to support a proposal to list it as threatened or endangered, but has not yet listed the species.

Basis for Consistency

Federally listed plant and animal species were considered during site evaluations (see Tables 6.6B-2, 6.6B-3 and 6.6B-4). Based on survey work and field observation, no listed plants were detected among the plants found on the MBPP site and none would be expected to occur on the site because favorable habitats are not present. No federally listed wildlife species are known to be on the MBPP site. With regard to the Morro shoulderband snail, a federally listed endangered species, a complete

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[1] Mueller, T.L., Esq., 1994. Guide to the Federal and California Endangered Species Laws, Planning and Conservation League Foundation, Sacramento, California.

survey according to USFWS protocol was not feasible due to seasonal constraints related to the optimal time to conduct a protocol survey. The survey that was conducted did not produce evidence for the presence of this species, however it cannot be ruled out that this species is present (at least in small numbers). It has been estimated that it is unlikely to be present and would not be common or abundant. The above information also applies to the California legless lizard, which is not listed but is a federal Species of Concern. Mitigating design features are listed in Section 6.6B.2.2 including pre-construction monitoring and translocation of individuals, if found. These measures will serve to avoid impacting both of these species. Information consultation with the Ventura office of the U.S. Fish and Wildlife Service has been initiated and the proposed measures to avoid impacting this species will be coordinated with the U.S. Fish and Wildlife Service.

The central California steelhead trout, a federally listed threatened species, was identified as being present in Morro Creek. Neither the stream, wetland nor riparian habitat of Morro Creek is proposed to be impacted by implementation of the Project. Design features are presented in Section 6.6.B.2.2 to mitigate for any potential indirect impacts that may occur to this habitat so that no impacts to this species would occur as a result of impacts to stream/riparian habitats adjacent to the MBPP. See Section 6.6A "Marine Biology" for discussions pertaining to the tidewater goby, a federally listed endangered species and the southern sea otter, a federally listed threatened species.

6.6B.3.2 CLEAN WATER ACT

6.6B.3.2.1 Clean Water Act – Section 404 (Wetlands)

Under Section 404 of the Clean Water Act the Corps is mandated to regulate activities that result in the discharge of dredged or fill material into waters of the United States. Pursuant to the Clean Water Act, the Corps' regulatory definition of wetlands is: " . . those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."[2] Implicit in the regulatory definition is the need for an area to meet certain water, soil and vegetation criteria in order to qualify as a federally regulated wetland. What is implicit in the regulatory definition is made explicit in the 1987 Manual, which identifies the key diagnostic criteria for determining the presence of wetlands as:

1) Wetland Hydrology: Inundation or saturation to the surface during the growing season.

2) Hydric Soils: Soils classified as hydric or that possess characteristics associated with reducing soil conditions.

3) Predominance of Wetland Vegetation: Vegetation classified as facultative, facultative wet,

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2 33 C.F.R. § 328.3(b).

or obligate according to its tolerance of saturated soil conditions.[3]

Specific criteria used to determine the presence or absence of wetland hydrology, soil and vegetation conditions are as follows:

1) Wetland Hydrology

The 1987 Manual states that the diagnostic environmental characteristics indicative of wetland hydrology conditions are: "the area is inundated either permanently or periodically at mean water depths less than or equal to 6.6 feet, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation" (1987 Manual, p. 14). According to the Manual, indicators of hydrologic conditions that occur in wetlands may include those in the following table:

Table 6.6B-5 Primary and Secondary Indicators

Primary Indicators	**Secondary Indicators**
Watermarks	Oxidized Rhizospheres Associated with Living Roots
Drift Lines	Water-Stained Leaves
Water-Borne Sediment Deposits	FAC-Neutral Test
Drainage Patterns Within Wetlands (With Caution)	Local Soil Survey Data

Department of the Army, U.S. Army Corps of Engineers, Washington, D.C., Memorandum - Subject: Clarification and Interpretation of the 1987 Manual, dated March 8, 1992 provides further clarification that:

> "Areas which are seasonally inundated and/or saturated to the surface for a consecutive number of days for more than 12.5 percent of the growing season are wetlands, provided the soil and vegetation parameters are met. Areas wet between 5 percent and 12.5 percent of the growing season in most years (see Table 5, page 36 of the 1987 Manual) may or may not be wetlands. Areas saturated to the surface for less than 5 percent of the growing season are non-wetlands. Wetland hydrology exists if field indicators are present as described herein and in the enclosed data sheet."

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3 1987 Manual, pp. 13 and 14.

2) Hydric Soils

The Corps' 1987 Manual states that the diagnostic environmental characteristics indicative of wetland soil conditions are met where "soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions" (1987 Manual, p.14). According to the Manual, indicators of soils developed under reducing conditions may include:

(a) Organic soils (Histosols)

(b) Histic epipedons

(c) Sulfidic material

(d) Aquic or peraquic moisture regime

(e) Reducing soil conditions

(f) Soil colors (chroma of 2 or less)

(g) Soil appearing on hydric soils list and

(h) Iron and manganese concretions

The Corps Memorandum, dated 20 February 1992, entitled "Regional Interpretation of the 1987 Manual", states that "The most recent version of National Technical Committee for Hydric Soils (NTCHS) hydric soil criteria will be used. At this writing, criteria published in the June 1991 Hydric Soils of the United States are current. These soil criteria specify at least 15 consecutive days of saturation or 7 days of inundation (flooding or ponding) during the growing season in most years."

A hydric soil as defined by the NTCHS (Federal Register, July 13, 1994, Volume 59, No. 133, page 35680) "is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part." The most recent version of the NTCHS's hydric soils criteria reflect those soils that are likely to meet this definition.

(a) All Histosols except Folists, or

(b) Soils in aquic suborders, great groups, or subgroups, albolls suborder, aquisalids, pachic subgroups, or cumulic subgroups that are:

    i. somewhat poorly drained with a water table equal to 0.0 foot (ft) from the surface during the growing season, or

    ii. poorly drained or very poorly drained and have either;

iii. water table equal to 0.0 ft during the growing season if textures are coarse sand, sand, or fine sand in all layers within 20 inches (in), or for other soils;

iv. water table at less than or equal to 0.5 ft from the surface during the growing season if permeability is equal to or greater than 6.0 in/hour (h) in all layers within 20 in, or

v. water table at less than or equal to 1.0 ft from the surface during the growing season if permeability is less than 6.0 in/h in any layer within 20 in, or

(c) Soils that are frequently ponded for long duration (7 to 30 days) or very long duration (30 + days) during the growing season, or

(d) Soils that are frequently flooded for long duration (7 to 30 days) or very long duration (30+ days) during the growing season.

(e) Predominance of Wetland Vegetation.

The 1987 Manual states that the diagnostic environmental characteristics indicating wetland vegetation conditions are met when the prevalent vegetation (more than 50%) consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions described above. In addition, hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions. Indicators of vegetation associated with wetlands include:

(a) more than 50% of the dominant species are rated as Obligate ("OBL"), Facultative Wet ("FACW") or Facultative ("FAC") on lists of plant species that occur in wetlands;[4]

(b) visual observations of plant species growing in areas of prolonged inundation or soil saturation; and

(c) reports in the technical literature indicating the prevalent vegetation is commonly found in saturated soils" (1987 Manual).

It is important to note that, although there is a high probability that one would expect to find obligate, facultative wet and facultative plants growing in wetlands, there is also a significant possibility that the obligate, facultative wet, and facultative species will occur in areas that do not exhibit wetland soil and/or wetland hydrology conditions.

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[4] Reed, P.B. 1988. National List of Plant Species That Occur in Wetlands: California (Region 0). Biological Report 88(26.10) May 1988. National Ecology Research Center, National Wetlands Inventory, U.S. Fish and Wildlife Service, St. Petersburg, FL.

Basis for Consistency

The proposed Project has been designed to avoid impacts to areas protected under the Clean Water Act. No permit authorization from the Corps of Engineers is required for the proposed Project due to the above-described avoidance of jurisdictional areas.

6.6B.3.2.2 Clean Water Act- Section 404 (Other Waters of the United States)

In addition to wetlands, the site was examined to determine the presence of other waters of the United States, including other special aquatic sites that would be subject to Corps regulation under the Clean Water Act. The definitions used in delineating these other waters of the United States included the following:

Other special aquatic sites: in addition to wetlands, EPA's 404(b)(1) guidelines list mud flats, vegetated shallows and coral reefs as other types of special aquatic sites.

(a) Mud Flats: ". . . broad flat areas along the sea coast and in coastal rivers to the head of tidal influence and in inland lakes, ponds, and riverine systems. Coastal mud flats are exposed at extremely low tides and inundated at high tides with the water table at or near the surface of the substrate. The substrate of mud flats contains organic material and particles smaller in size than sand. They are either unvegetated or vegetated only by algal mats."[5]

(b) Vegetated Shallows: ". . . permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as turtle grass and eelgrass in estuarine or marine systems . . ."[6]

(c) Coral Reefs: ". . . the skeletal deposit, usually of calcareous or silicaceous materials, produced by the vital activities of anthozoan polyps or other invertebrate organisms present in growing portions of the reef.[7]

(d) Territorial Seas: The limit of jurisdiction in the territorial seas is measured from the baseline in a seaward direction a distance of three nautical miles.[8]

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5 40 C.F.R. § 230.42.

6 40 C.F.R. § 230.43.

7 40 C.F.R. § 230.44.

8 33 C.F.R. § 328.4(a).

(e) Tidal Waters of the United States: "The landward limits of jurisdiction in tidal waters extends to the high tide line . . ." or, when adjacent non-tidal waters of the United States are present, to the limits of jurisdiction for such non-tidal waters.[9] High tide is further defined to include the line reached by spring high tides and other high tides that occur with periodic frequency.[10]

(f) Non-tidal Waters of the United States: In the absence of adjacent wetlands, the jurisdiction extends to the ordinary high water mark, or when adjacent wetlands are present, the jurisdiction extends beyond the ordinary high water mark to the limit of the adjacent wetlands.[11]

Basis for Consistency

The proposed project has been designed to avoid impacts to areas protected under the Clean Water Act. No permit authorization from the Corps of Engineers is required for the proposed project due to the above-described avoidance of jurisdictional areas.

6.6B.3.2.3 Clean Water Act – Section 401 (Water Quality)

Under Section 401 of the Clean Water Act projects that apply for a Department of the Army (Corps) permit for discharge of dredge or fill material, and projects that qualify for a Corps Permit, must obtain water quality certification from the Regional Water Quality Control Board (RWQCB) that the project complies with state water quality control standards.

Basis for Consistency

The proposed Project will not place any structures or fill material into Waters of the United States or the State of California. Therefore, no Department of the Army (Corps) permit is required under Section 404 of the Clean Water Act. As such, state water quality certification from the California Regional Water Quality Control Board, pursuant to Section 401 of the Clean Water Act, is not required.

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9 33 C.F.R. § 328.4(b).

10 33 C.F.R. § 328.3(d).

11 33 C.F.R. § 328.4(c)(1) and (2).

6.6B.3.3 RIVERS AND HARBORS ACT

6.6B.3.3.1 Rivers and Harbors Act – Section 9 (Bridges and Causeways)

Section 9 of the Rivers and Harbors Act, approved March 3, 1899 (33 U.S.C. 401) (hereinafter referred to as Section 9), prohibits the construction of any dam or dike across any navigable water of the United States in the absence of Congressional consent and approval of the plans by the Chief of Engineers and the Secretary of the Army. Where the navigable portions of the waterbody lie wholly within the limits of a single state, the structure may be built under authority of the legislature of that state if the location and plans or any modification thereof are approved by the Chief of Engineers and by the Secretary of the Army. The instrument of authorization is designated a permit (See 33 CFG part 321). Section 9 also pertains to bridges and causeways but the authority of the Secretary of the Army and Chief of Engineers with respect to bridges and causeways was transferred to the Secretary of Transportation under the Department of Transportation Act of October 15, 1966 (49 U.S.C 1155g(6)(A)). A Corps permit pursuant to Section 404 of the Clean Water Act is required for the discharge of dredged or fill material into waters of the United States associated with bridges and causeways. (See 33 CFR part 323).

The Corps Regulatory Guidance Letter "Guidance on Permits for Bridges on Historically Navigable Waters" (RGL 82-15, Issued 12-07-82) states:

> "1. The 1973 Memorandum of Agreement (MOA) with the United States Coast Guard clarifies the Corps responsibility under Section 10 of the River and Harbor Act of 1899 and the Coast Guard responsibilities under the Department of Transportation Act of 1966, with respect to bridges and causeways. The MOA does not address the Corps responsibilities under Section 404 for fills associated with bridges.
>
> 2. Recently, Public Law 97-322 removed from Coast Guard jurisdiction bridges or causeways "over waters which are not subject to the ebb and flow of the tide and which are not susceptible to use in their natural condition or by reasonable improvement as a means to transport interstate or foreign commerce. Thus, historical only waters were removed from Coast Guard jurisdiction over bridges and causeways.
>
> 3. In areas where the Corps and the Coast Guard differ on the limits of navigable waters of the United States and a bridge is beyond the limits of the Coast Guard jurisdiction, <u>district commanders will not require a Section 10 permit</u>. However, district commanders will review plans for proposed bridge, as appropriate, and suggest necessary changes to protect navigation and preclude conflicts with flood control projects.

4. District commanders must be careful to cite only Section 404 in public notices and documents for discharge of dredged or fill material associated with bridges and causeways. Conditions should not be added to Section 404 permits which address construction, operations, or maintenance of bridges or other bridge related construction which does not require a Section 404 permit. We expect that most bridge-related fills will be covered by one or more of the nationwide permits."

Basis for Consistency

The Morro Creek bridge crossing is designed to be consistent with U.S. Coast Guard requirements. Duke Energy is currently coordinating with the U.S. Coast Guard to obtain authorization for the bridge crossing. No Department of the Army (Corps) permit is required under Section 404 of the Clean Water Act since the project will not place any structures fill material into Waters of the United States.

6.6B.3.3.2 Rivers and Harbors Act of 1899 – Section 10 (Navigation)

Under Section 10 of the Rivers and Harbors Act, the construction of structures in, over, or under; excavation of material from; or deposition of material into "navigable waters" are regulated by the Corps. Navigable waters of the United States are defined as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impeded or destroy navigable capacity.[12] In tidal areas the limit of navigable waters is the mean high tide line and in non-tidal areas the ordinary high water mark. In addition, to the navigable waters described above, historically navigable waters are also subject to federal regulation under Section 10 of the Rivers and Harbors Act. Historically navigable waters are those areas that are no longer navigable as a result of artificial modifications, such as levees, dikes and dams.

Basis for Consistency

The proposed Morro Creek bridge crossing does not impact navigable waters as defined under Section 10 of the Rivers and Harbors Act. As such, no permitting is required under Section 10 of the Rivers and Harbors Act.

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12 33 C.F.R. §329.4

6.6B.3.4. CALIFORNIA ENDANGERED SPECIES ACT

The California Endangered Species Act (CESA; (Fish & Game Code Sections 2050, et seq.) generally parallels the main provisions of the Federal Endangered Species Act and is administered by the California Department of Fish and Game (CDFG). Under CESA the term "endangered species" is defined as a species of plant, fish, or wildlife which is "in serious danger of becoming extinct through all, or a significant portion of its range" and is limited to species or subspecies native to California.

CESA prohibits the "taking" of listed species except as otherwise provided in State law. Unlike its Federal counterpart, CESA applies the take prohibitions to species petitioned for listing (state candidates). Section 86 of the Fish and Game Code defines "take" as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

Plant species that are listed as endangered, threatened, or rare or candidates for listing are protected under the CESA. In addition, all of the plants included in Lists 1 and 2 of the California Native Plant Society (CNPS) Inventory 13 meet the definition of Sections 2062 and 2067 (California Endangered Species Act) of the California Department of Fish and Game Code or Section 1901, Chapter 10 (Native Plant Protection Act) and are eligible for state listing. Some of the plants constituting List 3 meet the definitions of Section 1901, Chapter 10 or Sections 2062 and 2067 of the California Department of Fish and Game Code and are eligible for state listing. Plants on Lists 1, 2 and 3 are also considered during preparation of documents under CEQA or the Warren Alquist Act. A CNPS List 1A plant is a species, subspecies, or variety that is considered to be extinct. A List 1B plant is considered rare, threatened, or endangered in California but is more common elsewhere. A List 3 plant is a species for which CNPS lacks necessary information to determine if it should be assigned to a list. A List 4 plant has a limited distribution in California. The CDFG does not generally consider impacts to List 3 and List 4 species to be significant.

State lead agencies are required to consult with CDFG to ensure that any action it undertakes is not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat.

Basis for Consistency

State listed plant and animal species were considered during site evaluations (see Tables 6.6B-2, 6.6B-3 and 6.6B-4). In addition, plant species on the CNPS lists were also considered. Based on survey work and field observation, no listed plants were detected among the plants found on the MBPP site. The Biological Survey Report authors conclude that no state listed threatened or

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13 Skinner, M.W. and B.M. Pavlik, 1994. Inventory of Rare and Endangered Vascular Plants of California. (5th Ed.), Special Publ. #1, California Native Plant Society, Sacramento, California.

endangered wildlife species are known to be on the site of the MBPP.

California species of special concern were also considered during site surveys and evaluations. Only one state species of special concern is known to occur on site, the burrowing owl. Mitigating design features are proposed to reduce the impact to the one burrowing owl winter burrow to less than significant utilizing CDFG guidelines.

6.6B.3.5 CALIFORNIA FISH AND GAME CODE

The California Fish and Game Code Sections 1600-1607 established a process to ensure that projects conducted in and around lakes, rivers, or streams do not adversely impact fish and wildlife resources, or when adverse impacts cannot be avoided, ensures that adequate mitigation and/or compensation is provided. The program developed by the California Department of Fish and Game (CDFG) to implement this process is generally referred to as the Lake/Streambed Alteration Agreement Program.

Sections 1601 and 1603 of the Fish and Game Code regulate the agreement process. Fish and Game Code Section 1601 is concerned with <u>any project</u> proposed by a state or local government agency or public utility which:

> "...will divert, obstruct or change the natural flow or bed, channel or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, or (any project which) will use material from the streambeds designated by the department..."

Fish and Game Code Section 1603 is concerned with projects proposed by any person (other than those covered by Section 1601) which will:

> "substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or lake designated by the department, or use any material from the streambeds..."

CDFG jurisdiction is within the waterbody of any natural river, stream or lake. The term stream, which includes creeks and rivers, is defined in Title 14, California Code of Regulations (CCR), Section 1.72:

> "A stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation."

However, this definition does not define the terms bed, channel, or bank and does not define other stream-related features such as aquatic life, riparian vegetation, etc.

The following concepts have therefore been developed by CDFG to further clarify the definition stated above.[14]

The term stream can include intermittent and ephemeral streams, rivers, creeks, dry washes, sloughs, blue-line streams (United States Geological Survey maps), and watercourses with subsurface flows. Canals, aqueducts, irrigation ditches, and other means of water conveyance can also be considered streams if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife.

Biologic components of a stream may include aquatic and riparian vegetation, all aquatic animals including fish, amphibians, reptiles, invertebrates, and terrestrial species which derive benefits from the stream system.

As a physical system, a stream not only includes water (at least on an intermittent or ephemeral basis), but also a bed or channel, a bank and/or levee, instream features such as logs or snags, and various flood plains depending on the return frequency of the flood event being considered (i.e. 10, 50, or 100 years, etc.).

The lateral extent of a stream can be measured in several ways depending on a particular situation and the type of fish or wildlife resource at risk. The following criteria are presented in order from the most inclusive to the least inclusive:

The flood plain of a stream can be the broadest measurement of a stream's lateral extent depending on the return frequency of the flood event used. For most flood control purposes, the 100-year flood event is the standard measurement and maps of the 100-year flood plain exist for many streams. However, the 100-year flood plain may include significant amounts of upland or urban habitat and therefore may not be appropriate in many cases.

The outer edge of riparian vegetation is generally used as the line of demarcation between riparian and upland habitats and is therefore a reasonable and identifiable boundary for the lateral extent of a stream. In most cases, the use of this criterion should result in protecting the fish and wildlife resources at risk.

Most streams have a natural bank which confine flows to the bed or channel except during flooding. In some instances, particularly on smaller streams or dry washes with little or no riparian habitat, the bank should be used to mark lateral extent of a stream.

A levee or other artificial stream bank could also be used to mark the lateral extent of a stream. However, in many instances, there can be extensive areas of valuable riparian habitat located behind a levee.

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[14] California Department of Fish and Game, Environmental Services Division, 1994, A Field Guide to Lake and Streambed Alteration Agreements, Section 1600-1607 California Fish and Game Code

"Any of the above criteria could be applicable in determining what constitutes a stream depending on the potential for the proposed activity to adversely affect fish and other stream dependent wildlife resources."[15]

Basis for Consistency

Habitats under CDFG jurisdiction under Fish and Game Code 1601-1603 are shown in Figure 6.6B-4. The proposed Project will not impact any streambed habitats subject to CDFG jurisdiction. This will be accomplished by not placing any structures or modifying the regulated streambed and associated stream zone/riparian habitat.

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[15] California Department of Fish and Game, Environmental Services Division, 1994, A Field Guide to Lake and Streambed Alteration Agreements, Section 1600-1607 California Fish and Game Code

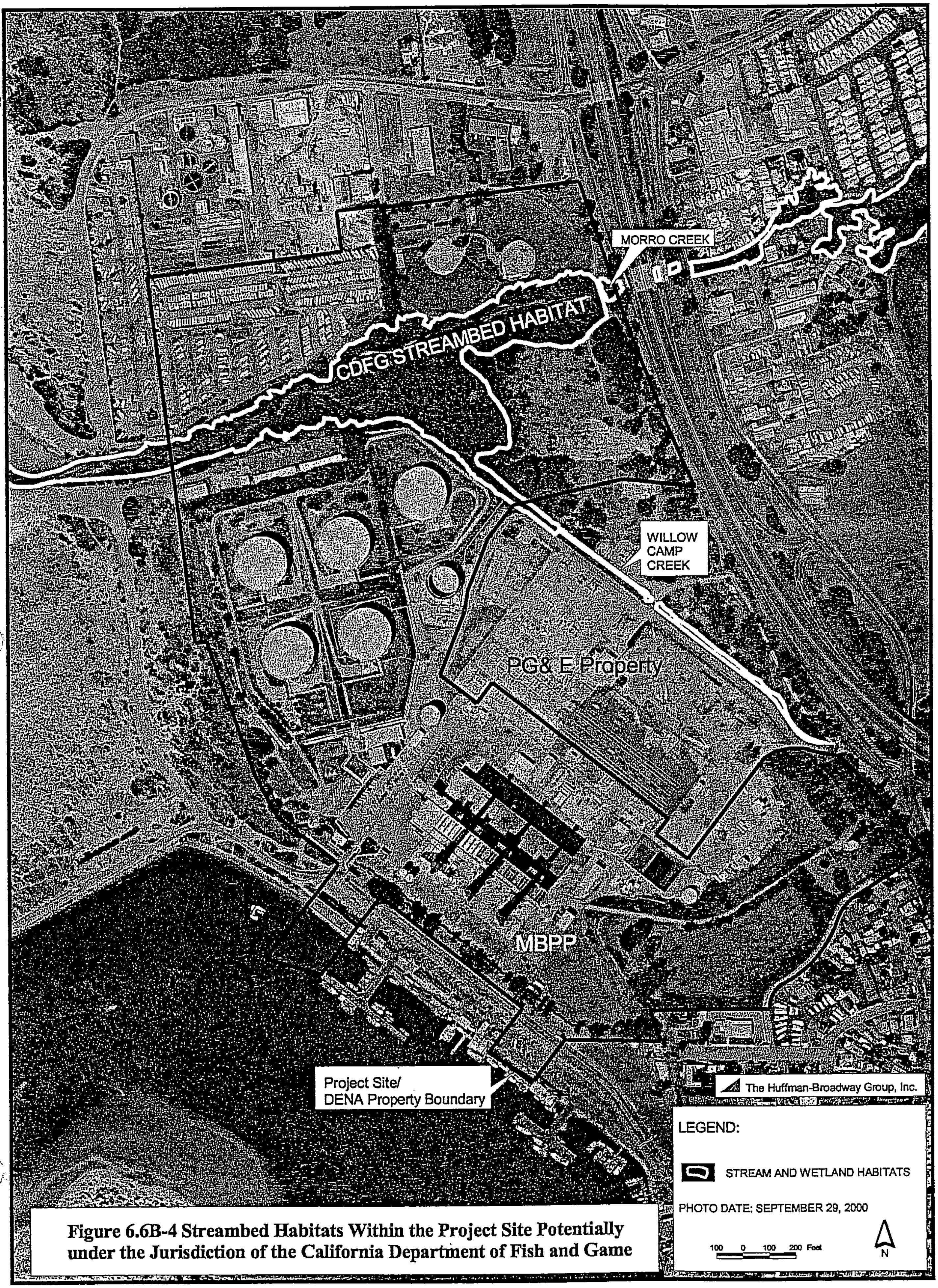


Figure 6.6B-4 Streambed Habitats Within the Project Site Potentially under the Jurisdiction of the California Department of Fish and Game

6.6B.3.6 CALIFORNIA COASTAL ACT -

In California, the coastal zone is protected under the California Coastal Act of 1976 and falls within the jurisdiction of the California Coastal Commission (CCC). A Coastal Development Permit issued by the CCC is typically required for most new development located within the coastal zone. **However, permitting requirements from the CCC are superseded in the case of this Project by actions taken by the CEC licensing process (PRC §25000).** The following information is provided as background information as to how various environmentally sensitive habitat boundaries are defined by the California Coastal Act. Under Section 30103 of the California Coastal Act "coastal zone" means that land and water area of the State of California from the Oregon border to the border of the Republic of Mexico, specified on the maps identified and set forth in Section 17 of that chapter of the Statutes of the 1975-76 Regular Session enacting this division, extending seaward to the state's outer limit of jurisdiction, including all offshore islands, and extending inland generally 1,000 yards from the mean high tide line of the sea. In significant coastal estuarine habitat, and recreational areas it extends inland to the first major ridgeline paralleling the sea or five miles from the mean high tide line of the sea, whichever is less, and in developed urban areas the zone generally extends inland less than 1,000 yards.

According to Section 13577, of Title 14, for purposes of Public Resources Code Sections 30519, 30600.5, 30601, 30603, and all other applicable provisions of the Coastal Act of 1976, the precise boundaries of the jurisdictional areas pertaining to wetlands, streams, estuaries, tidelands, submerged lands, public trust lands and beaches are determined using the following criteria:

1) Streams

Measure 100 feet landward from the top of the bank of any stream mapped by USGS on the 7.5 minute quadrangle series, or identified in a local coastal program. The bank of a stream shall be defined as the watershed and relatively permanent elevation or acclivity at the outer line of the stream channel which separates the bed from the adjacent upland, whether valley or hill, and serves to confine the water within the bed and to preserve the course of the stream. In areas where a stream has no discernable bank, the boundary shall be measured from the line closest to the stream where riparian vegetation is permanently established. For purposes of this section, channelized streams not having significant habitat value should not be considered.

2) Wetlands

(a) Under Section 30121 of the California Coastal Act the term "wetland" means lands within the coastal zone which may be covered periodically or permanently with shallow water and includes saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens.

Under the California Code of Regulations wetlands are defined as follows:

Wetlands shall be defined as land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetland or deepwater habitats. (14 CCR 13577[b])

(b) Measure 100 feet landward from the upland limit of the wetland. Wetland shall be defined as land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetlands or deepwater habitats. For purposes of this section, the upland limit of a wetland shall be defined as:

i. the boundary between land with predominately hydrophytic cover and land with predominately mesophytic or xerophytic cover.

ii. the boundary between soil that is predominately hydric and soil that is predominately nonhydric; or

iii. in the case of wetlands without vegetation or soils, the boundary between land that is flooded or saturated at some time during years of normal precipitation, and land that is not.

(c) For the purposes of this section, the term "wetland" shall not include wetland habitat created by the presence of and associated with agricultural ponds and reservoirs where:

i. the pond or reservoir was in fact constructed by a farmer or rancher for agricultural purposes; and

ii. there is no evidence (e.g. aerial photographs, historical survey, etc.) showing that wetland habitat pre-dated the existence of the pond or reservoir. Areas with drained hydric soils that are no longer capable of supporting hydrophytes shall not be considered wetlands.

3) Estuaries

Measure 300 feet landward from the mean high tide line of the estuary. For purposes of this section, an estuary shall be defined as a coastal water body, usually semi-enclosed by land, having open, partially obstructed, or intermittent exchange with the open ocean, and in which ocean water is at least occasionally diluted by freshwater from the land. The salinity level may be periodically increased to above that of the open ocean due to evaporation. The mean high tide line shall be defined as the statistical mean of all the high tides over the cyclical period of 18.6 years, and shall be determined by reference to the records and elevations of tidal benchmarks established by the National Ocean Survey. In areas where observations covering a period of 18.6 years are not available, a determination may be made based on observations covering a shorter period, provided they are corrected to a mean value by comparison with observations made at some suitably located control tide station.

4) Tidelands

Tidelands are defined as lands which are located between the lines of mean high tide and mean low tide.

5) Submerged Lands

Submerged lands are defined as lands which lie below the line of mean low tide.

6) Public Trust Lands

Public Trust lands are defined as all lands subject to the Common Law Public Trust for commerce, navigation, fisheries, recreation, and other public purposes. Public Trust lands include tidelands, submerged lands, the beds of navigable lakes and rivers, and historic tidelands and submerged lands that are presently filled or reclaimed, and which were subject to the Public Trust at any time.

7) Beaches

Measure 300 feet landward from the inland extent of the beach. The back beach, or dry beach, if it exists, shall be included. The inland extent of the beach shall be determined as follows:

(a) from a distinct linear feature (e.g., a seawall, road, or bluff, etc.);

(b) from the inland edge of the further inland beach berm as determined from historical surveys, aerial photographs, and other records or geological evidence; or

(c) where a beach berm does not exist, from the further point separating the dynamic portion of the beach from the inland area as distinguished by vegetation, debris or other geological or historical evidence.

6.6B.3.7 CITY OF MORRO BAY GENERAL PLAN, COASTAL LAND USE PLAN, AND LOCAL COASTAL PROGRAM

The City of Morro Bay General Plan (GP), Coastal Land Use Plan (LUP), and Local Coastal Program (LCP) and Zoning Ordinance/Municipal Code (MC) contain policies that relate to protecting terrestrial biological resources in Morro Bay. The following discussion is provided to indicate the project's consistency with City programs, policy and regulations.

6.6B.3.7.1 City of Morro Bay – GP Program LU-40.4

The City will require that new pipelines and transmission lines are installed with suitable mitigation measures such as erosion control, revegetation, and other measures necessary to protect all scenic resources and habitat values.

Basis for Consistency

The Project uses existing transmission lines and natural gas pipelines. The Project includes the construction of one on site high pressure gas pipeline intertie to connect the modernized facility to the existing PG&E high pressure gas manifold system. This pipeline will be located under ground by boring underneath Willow Camp Creek to prevent disturbance of the streambed and eliminate disruption of the associated wetland and stream/ riparian vegetation. Use of boring equipment to install the high pressure gas pipeline will avoid impacts to the wetland and stream/riparian habitats

6.6B.3.7.2 City of Morro Bay – GP Program LU-40.15

Any expansion of the PG&E power plant shall give priority to the options that would best utilize available on site space. Additionally, no dunes areas should be disrupted unless there is no other less environmentally damaging alternative. PG&E shall contribute to the dunes stabilization program and reimburse their pro rata share of any Coastal Conservancy (or City) expenditure for dune stabilization in this area. (Land Use Plan policy # 5.20) (LCP 126-127).

Basis for Consistency

The Project is a modernization of the existing MBPP facility. Nevertheless, the Project will occur entirely on the existing previously disturbed MBPP site. The least disruptive location for the construction road has been chosen though grasslands and an existing dirt road to avoid dune habitat.

6.6B.3.7.3 City of Morro Bay – GP Objective

Ensure that the delicate balance of the environment is not upset and that urbanization takes place only if protection of the environment can be guaranteed. (OS 85)

Basis for Consistency

All facilities and structures will be constructed within the existing disturbed Duke Energy property and will not encroach on sensitive habitat or open space. The Project occurs within the existing disturbed Duke Energy property with the following exceptions: the bridge over Morro Creek which will span the creek and will not impact environmentally sensitive habitats; the temporary construction road which will traverse disturbed grassland and then will be aligned within an existing graded dirt road and the high pressure gas pipeline intertie which will be bored under Willow Camp Creek to prevent disturbance to streambed and associated wetland and stream/riparian vegetation. The Project complies with applicable federal, state, and local environmental requirements.

6.6B.3.7.4 City of Morro Bay – GP Objective

Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas.

Basis for Consistency

The Project is sited and designed to prevent impacts to adjacent environmentally sensitive habitats or areas.

6.6B.3.7.5 City of Morro Bay – GP Policy LU-55

All environmentally sensitive habitat areas shall be protected against adverse impacts to the maximum extent feasible.

Basis for Consistency

The Project is sited and designed to prevent significant impacts to adjacent environmentally sensitive habitats or areas.

6.6B.3.7.6 City of Morro Bay – GP Program LU-55.2

Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade such areas, and shall maintain the habitat's functional capacity.

Basis for Consistency

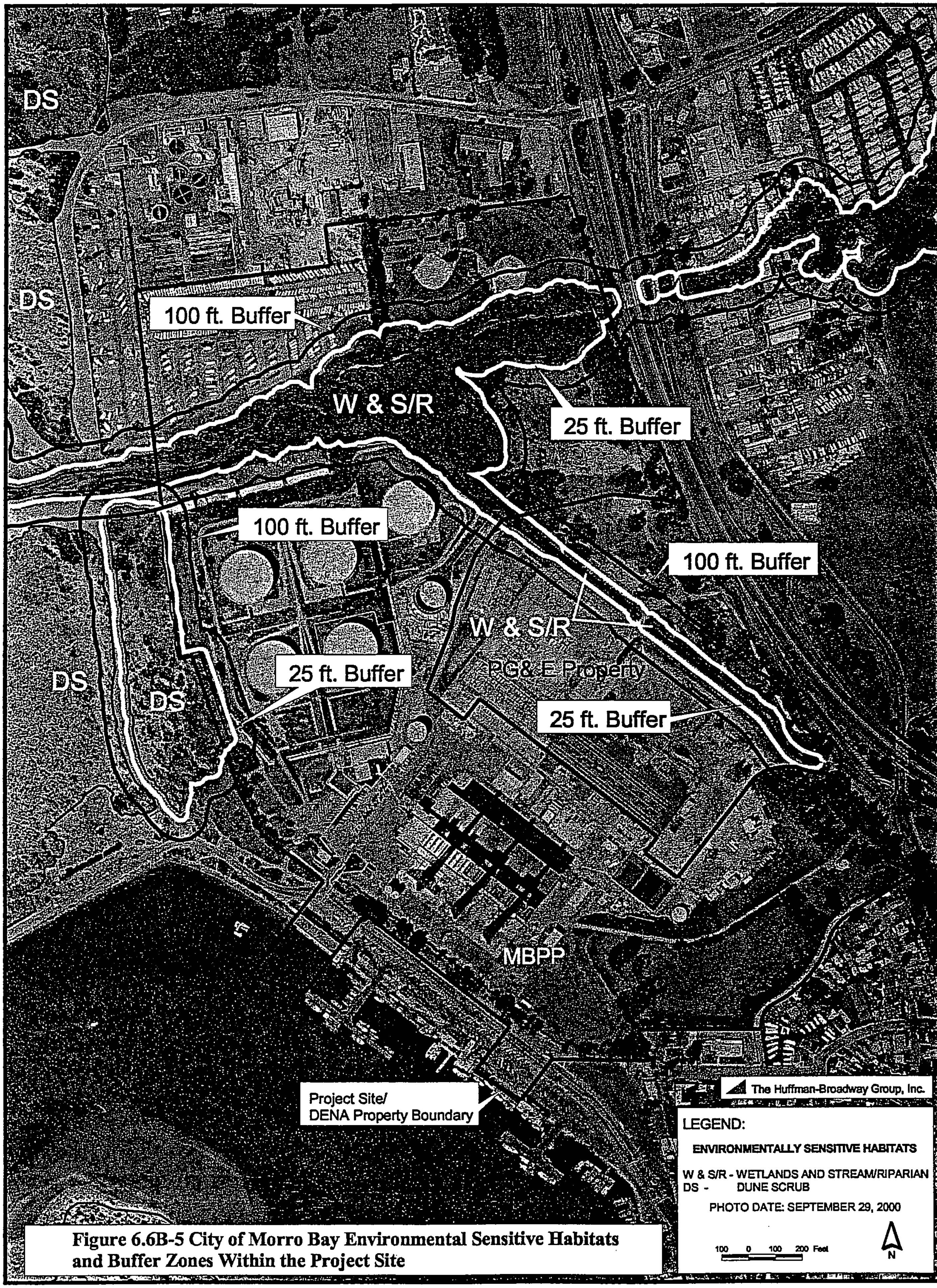
The Project is sited and designed to prevent impacts to adjacent environmentally sensitive habitats or areas.

6.6B.3.7.7 City of Morro Bay – GP Program LU-55.3

No land divisions shall be allowed in the environmentally sensitive habitat areas of the wetlands, sand dunes, stream beds and endangered wildlife habitats as designated GP-6, unless the land division is for the express and sole purpose of transferring the property to a public management agency or for some other bona-fide conservation purpose.

Basis for Consistency

The Project will be carried out without any land division that will affect Environmentally Sensitive Habitat.



LEGEND:

ENVIRONMENTALLY SENSITIVE HABITATS

W & S/R - WETLANDS AND STREAM/RIPARIAN
DS - DUNE SCRUB

PHOTO DATE: SEPTEMBER 29, 2000

100 0 100 200 Feet

N

Figure 6.6B-5 City of Morro Bay Environmental Sensitive Habitats and Buffer Zones Within the Project Site

6.6B.3.7.8 City of Morro Bay – GP Program LU-55.4

Buffering setback areas a minimum of 100 feet from sensitive habitat areas shall be required. In some habitat areas, setbacks of more than 100 feet shall be required if environmental assessment results in information indicating a greater setback area is necessary for protection. No permanent structures shall be permitted within the setback area except for structures of a minor nature such as fences or at-grade improvements for pedestrian or equestrian trails. Such projects shall be subject to review and comment by the Department of Fish and Game prior to commencement of development within a setback area. For other than wetland habitats, if application of the 100-foot buffer on previously subdivided parcels would render the subdivided parcel unusable for its designated use, the setback area may be adjusted downward only to a point where the designated use is accommodated but in no case is the buffer to be less than 50 feet. The lesser setback shall be established in consultation with the Department of Fish and Game. If a setback area is adjusted downward, mitigation measures developed in consultation with the Department of Fish and Game shall be implemented.

Basis for Consistency

The Project will provide appropriate buffer setback areas for Environmentally Sensitive Habitats (see Figure 6.6B-5). No permanent structures will be located in the buffer areas except for existing structures or where existing structures were, or are. These include an existing dirt access road where the temporary construction road and bike/pedestrian path will be located west and northwest of the MBPP and existing levees on the north, northwest and northeast of the MBPP site. These levees were constructed over 40 years ago to provide flood protection for the MBPP site. A clear span bridge will be constructed over Morro Creek and will avoid sensitive wetland and stream/riparian habitats by locating the support structures outside of sensitive habitat.

6.6B.3.7.9 City of Morro Bay – GP Program LU-55.8

A minimum buffer strip along streams shall be required as follows:

1) a minimum buffer strip of 100 feet in rural areas;

2) a minimum buffer strip of 50 feet in urban areas.

If the applicant can demonstrate that the implementation of the minimum buffer on previously subdivided parcels would render the subdivided parcel unusable for its designated use, the buffer may be adjusted downward only to a point where the designated use is accommodated but in no case is the buffer to be less than 50 feet for rural areas and 25 feet for urban areas. Only when all other means of project modification are found inadequate to provide for both the use and the minimum buffer. The lesser setback shall be established in consultation with the U.S. Fish and Wildlife and the California Department of Fish and Game and shall be accompanied by adequate mitigations. The buffer area shall be measured landward from the landward edge of riparian vegetation or from the top of the bank (e.g., in channelized streams). Maps and supplemental information may be required to determine these boundaries (LCP 221).

Basis for Consistency

The Project will use a 25-foot buffer along Morro Creek measured from the outer edge of the riparian vegetation. Existing MBPP structures and temporary construction access road/bridge crossing do not allow for a 50-foot riparian buffer to be used. If necessary, given that these are existing structures Duke Energy will work with the US Fish and Wildlife Service and the California Department of Fish and Game to determine if any mitigation measures are necessary.

6.6B.3.7.10 City of Morro Bay – GP Program LU-55.9

Adjustments to the minimum buffer must protect the biological productivity and water quality of the streams. Assessment of impact shall include, but not be limited to the following factors: (a) Soil type and stability of stream corridors; (b) How surface water filters into the ground; (c) Slope of land on either side of the stream; and (d) Location of the 100 year flood plain boundary.

Where riparian vegetation has been previously removed, except for stream channelization, the buffer shall allow for the re-establishment of riparian vegetation to its prior extent to the greatest degree possible.

Basis for Consistency

The Project will use a 25-foot buffer along Morro Creek measured from the outer edge of the riparian vegetation. Existing MBPP structures and temporary construction access road/bridge crossing do not allow for a 50-foot riparian buffer to be used. If necessary, given that these are existing structures Duke Energy will work with the US Fish and Wildlife Service and the California Department of Fish and Game to determine if any mitigation measures are necessary.

6.6B.3.7.11 City of Morro Bay – GP Program LU-55.10

No structures shall be located within the stream corridor except: public trails located within a buffer when no alternative location is feasible but outside of riparian habitat; necessary water supply projects; flood control projects where no other method for protecting existing structures in the flood plain is feasible and where such protection is necessary for public safety or to protect existing development; and development where the primary function is the improvement of fish and wildlife habitat. Bridges (when support structures are located outside the critical habitat areas) may be permitted when no alternative route/location is feasible. All development shall incorporate the most protective mitigations feasible (LCP 212).

Basis for Consistency

The Project will build a bridge over Morro Creek to improve public access. There is not another feasible location for the bridge which would have less environmental impacts. The bridge will not have structures in critical habitat and will incorporate the most protective mitigations feasible. No other structures will be constructed in the wetland or stream/riparian habitats.

6.6B.3.7.12 City of Morro Bay – GP Program LU-55.11

All permitted development, including dredging, filling, and grading within stream beds and setback buffer areas shall be limited to activities necessary for the construction of uses specified in the above policy [Program LU-55.10]. When such activities require removal of riparian plant species, revegetation with local native riparian species shall be required. Projects, which would cause the removal of vegetation, shall be subject to review and comment by U.S. Fish and Wildlife Service and the Department of Fish and Game.

Basis for Consistency

The Project will comply with the buffer zone requirements and maintain existing buffers. The bridge over Morro Creek is allowed in Program LU-55.10. California native plants will be used for revegetation. Selection of California native plant species will be done in coordination with the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

6.6B.3.7.13 City of Morro Bay – GP Program LU-55.12

The Biological productivity of the city's environmentally sensitive habitat areas shall be maintained and, where feasible, restored through maintenance and enhancement of the quality and quantity of Morro and Chorro groundwater basins and through prevention of interface with surface water flow. Stream flows adequate to maintain riparian and fisheries habitat shall be protected.

Basis for Consistency

The Project will maintain Environmentally Sensitive Habitat and Morro groundwater basin. The Project will not impact the stream flow of Morro or Willow Camp Creeks. The grading plan requires drainage to be routed away from Morro and Willow Camp Creeks.

6.6B.3.7.14 City of Morro Bay – GP Program LU-55.14

No vehicle traffic shall be permitted in wetlands and pedestrian traffic shall be regulated and incidental to the permitted uses. New development adjacent to wetlands shall not result in adverse impacts due to additional sediment, runoff, noise, and other disturbances.

Basis for Consistency

The Project will only allow limited pedestrian traffic in wetlands that is regulated and incidental to permitted uses. The Project will not result in adverse impacts to Environmentally Sensitive Habitat or adjacent wetlands.

6.6B.3.7.15 City of Morro Bay – GP Program LU-57.2

All non-authorized motor vehicles shall be prohibited in beach and dune areas. A buffer strip, a minimum of 50 feet in width in urban areas and 100 feet in non-urban areas shall be maintained between the dune habitat and adjacent development. All permitted uses shall be regulated and restrictions enforced to protect critical bird habitats during breeding and nesting seasons. Controls may include restriction of access, noise abatement, restriction of hours of operation of public or private facilities. For all permitted uses within dune habitat areas, including recreation, foot traffic on vegetated dunes shall be minimized. Where access through dunes is necessary or established through historical public use, well-defined footpaths or boardwalks shall be developed and used. (LCP 213).

Basis for Consistency

The Project will not disturb dunehabitat or disrupt critical bird habitats during breeding and nesting seasons when building the construction road. The least disruptive location for the construction road has been chosen through grasslands avoiding dune habitat. The existing dirt alignment will be used for the construction road and bike/pedestrian path. Motorized vehicles will be confined to the construction road for the Project. The Project will maintain the existing buffer zones for dune habitat (see Figure 6.6B-5).

6.6B.3.7.16 City of Morro Bay – GP Program LU-58.2

Coastal dune habitats shall be preserved and protected from all but resource-dependent, scientific, educational, and passive recreational use. Disturbance or destruction of any dune vegetation shall be prohibited, unless no feasible alternative exists, and then only if revegetation is made a condition of project approval. Such revegetation shall be with native plants propagated from the disturbed sites or from the same species at adjacent sites. (LP 213)

Basis for Consistency

The Project will not disturb dune (dune scrub habitat) when building the construction road. A qualified biologist will assist in the staking of the road alignment to ensure that no dune scrub habitat will be impacted by the bike/pedestrian path or temporary road alignments. The least disruptive location for the construction road has been chosen through grasslands and an existing dirt road alignment avoiding dune scrub habitat. The existing dirt alignment will be used for the construction road and bike/pedestrian path. Motorized vehicles will be confined to the construction road for the Project. The Project will maintain the existing buffer zones for dune scrub habitat (see Figure 6.6B-5)

6.6B.3.7.17 City of Morro Bay – GP Policy LU-60.0

The precise location and thus boundary line of Environmentally Sensitive Habitat areas shall be determined based upon a field study paid for by the applicants and performed by the City or the City's consultants and approved by City Council and/or their appointed designee. Prior to the approval of development on the site, including but not limited to, a division of land, provision of public access, or restoration of the ESH. (LCP 213)

Basis for Consistency

This AFC delineates the exact boundaries of Environmentally Sensitive Habitat (see Figure 6.6B-5) and the Project complies with applicable requirements to protect sensitive habitats.

6.6B.3.7.18 City of Morro Bay – GP Policy LU-61

As a condition of approval of development and prior to commencement of any development, property owners/applicants shall dedicate appropriate permanent easements over portions of the property determined to be sensitive habitat, such as dunes, beach, wetlands, or riparian corridor. (CDP 213)

Basis for Consistency

The Project will provide a conservation easement over the Environmentally Sensitive Habitat areas that are a part of the existing MBPP site.

6.6B.3.7.19 City of Morro Bay –LUP Policy 1.17

When PG&E property is needed for coastal-dependent energy industrial uses, a vertical (east-west) public access path for pedestrians and bicyclists no less than 10 feet in width shall be required as a condition of development, consistent with public safety needs and the need to protect the operations of the new facilities. A location paralleling the creek shall be allowed, provided the path does not encroach into environmentally sensitive habitat areas or buffer zones.

Basis for Consistency

The Project significantly improves coastal access by creating or improving three segments of a bike and pedestrian path around the plant site. Of particular importance is a bridge over Morro Creek and a new east-west bike path between Highway 1 and the Embarcadero (see Figures 6.6B-5). None of the coastal access paths will encroach into Environmentally Sensitive Habitat or buffer zones except the path that will be within an existing roadway to the west of the MBPP project.

6.6B.3.7.20 City of Morro Bay – LCP Policy 5.08

The City will require that new pipelines and transmission lines be installed with suitable mitigation measures such as erosion control, revegetation, and other measures necessary to protect all scenic resources and habitat values.

Basis for Consistency

The Project uses existing transmission lines and natural gas pipelines. The Project includes the construction of one on site intertie to connect the modernized facility to the existing PG&E high pressure gas manifold system. This pipeline will be located under ground by boring underneath Willow Camp Creek to prevent disturbance of the streambed and eliminate disruption of the associated wetland and stream/riparian vegetation. Use of boring equipment to install the high pressure gas pipeline will avoid impacts to the wetland and stream/riparian habitats.

6.6B.3.7.21 City of Morro Bay – LCP Policy 5.11

Due to the presence of sensitive wetlands and endangered species habitat and the City's status as a Bird Sanctuary, the City will advocate that the Coastal Commission change the recommendation of its Power Plant Siting Study to designate all areas within the City limits except the site presently occupied by the PG&E Power Pant, as unsuitable for power plant siting, and designate the City's primary coastal-dependent permitted use as commercial fishing and recreation. (General Plan policy # LU-40.7)

Basis for Consistency

The Project will be constructed entirely within the site previously described as the PG&E power plant.

6.6B.3.7.22 City of Morro Bay – LCP Policy 5.20

Any expansion of the PG&E power plant shall give priority to the options that would best utilize available on site space. Additionally, no dunes areas should be disrupted unless there is no other less environmentally damaging alternative. PG&E shall contribute to the dunes stabilization program and reimburse their pro rata share of any Coastal Conservancy (or City) expenditure for dune stabilization in this area. (General Plan policy # LU-40.15)

Basis for Consistency

The Project is a modernization of the existing MBPP facility. Nevertheless, the Project will occur entirely on the existing previously disturbed MBPP site. The least disruptive location for the construction road has been chosen though grasslands and an existing dirt roadway to avoid dune (dune scrub) habitat.

6.6B.3.7.23 City of Morro Bay – LCP Policy 11.01

Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas. The City shall either prepare a wetlands/estuarine map or, if funding does not permit such preparation, adopt the National Wetland Inventory by U.S. Fish and Wildlife Service dated 1979, as the mapping illustration of the wetland and estuarine areas contained within City boundaries. If the City adopts the National Wetland Inventory Mapping as their LUP wetlands habitats and types, all proposed development located within 100 feet of the mapped wetland boundaries shall be required to submit additional mapping based on U.S. Fish and Wildlife and Coastal Commission Statewide Interpretive Guidelines done by a qualified biologist. The additional mapping will be submitted for review and approval from U.S. Fish and Wildlife and the California Department of Fish and Game. After public agency approval has been obtained, the City shall define buffer areas except where biologists identify the need for a greater buffer to protect the overall wetland system or a particular resource. Developments permitted within wetland and/or buffer areas are limited to the uses listed in Section 30233(c) of the Coastal Act.

Basis for Consistency

The Project is sited and designed to prevent significant impacts to adjacent environmentally sensitive habitats or areas. This AFC maps Environmentally Sensitive Habitat and appropriate buffers and improvements to protect these areas are incorporated into the Project (see Figure 6..6B-5).

6.6B.3.7.24 City of Morro Bay – LCP Policy 11.02

Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade such areas, and shall maintain the habitats' functional capacity.

Basis for Consistency

The Project is sited and designed to prevent impacts to adjacent environmentally sensitive habitats or areas.

6.6B.3.7.25 City of Morro Bay – LCP Policy 11.04

No land division shall be allowed in the environmentally sensitive habitat areas of wetlands, sand dunes (dune scrub), stream beds and endangered wildlife habitats as designated on Figure 6.6B-2a, unless the land division is for the express and sole purpose of transferring the property to a public management agency or for some other bona fide conservation purpose.

Basis for Consistency

The Project will be carried out without any land division that will affect Environmentally Sensitive Habitat.

6.6B.3.7.26 City of Morro Bay – LCP Policy 11.05

Prior to the issuance of a coastal development permit, all projects on parcels containing environmentally sensitive habitat as depicted on the Land Use Plan map or habitat map included within the LUP and on the adopted U.S Fish and Wildlife wetland inventory map, or projects on parcels within 250 feet of all designated areas (except wetland where projects on parcels within 1000 feet is the criterion), or projects having the potential to affect an environmentally sensitive habitat area must be found to be in conformity with the applicable habitat protection policies of the Land Use Plan. All development plans, grading plans, etc. shall show the precise location of the habitat(s) potentially affected by a proposed project. Projects, which could adversely impact an environmentally sensitive habitat area, shall be subject to adequate environmental impact assessment by a qualified biologist(s). In areas of the City where sensitive habitats are suspected to exist but are not presently mapped or identified in the city's Land Use Plan, projects shall undergo an initial environmental impact assessment to determine whether or not these habitats exist. Where such habitats are found to exist, they shall be included in the City's environmentally sensitive habitat mapping included within the LUP.

Basis for Consistency

This AFC maps Environmentally Sensitive Habitat (see Figure 6.6B-5) and complies with all the applicable habitat protection policies of the Land Use Plan. This AFC serves as a comprehensive environmental impact report.

6.6B.3.7.27 City of Morro Bay – LCP Policy 11.06

Buffering setback areas a minimum of 100 feet from sensitive habitat areas shall be required. In some habitat areas, setbacks of more than 100 feet shall be required if environmental assessment results in information indicating a greater setback area is necessary for protection. No permanent structures shall be permitted within the setback area except for structures of a minor nature such as fences or at-grade improvements for pedestrian or equestrian trails. Such projects shall be subject to review and comment by the department of Fish and Game prior to commencement of development within a setback area. For other than wetland habitats, if subdivision parcels would render the subdivided parcel unusable for its designated use, the setback area may be adjusted downward only to a point where the designated use is accommodated but in no case is the buffer to be less than 50 feet. The lesser setback shall be established in consultation with the Department of Fish and Game. If a setback area is adjusted downward mitigation measures developed in consultation with the Department of Fish and Game shall be implemented.

Basis for Consistency

The Project will provide an appropriate buffer setback areas for Environmentally Sensitive Habitats (see Figure 6.6B-5). No permanent structures will be located in the buffer areas except for existing structures or where existing structures were, or are, located. These include an existing dirt access road where the temporary construction road and pedestrian bike/path will be located west and northwest of the MBPP and existing levees on the north, northwest and northeast sides of the MBPP site. These levees were constructed over 40 years ago to provide flood protection for the MBPP site. A clear span bridge will be constructed over Morro Creek and will avoid sensitive wetland and stream/ riparian habitats by locating the support structures outside of sensitive habitats.

6.6B.3.7.28 City of Morro Bay – LCP Policy 11.10

Only native vegetation shall be planted in the habitat areas of rare or endangered species. Where feasible, use of drought tolerant plants of a native variety shall be used in coastal zone areas.

Basis for Consistency

All revegetation associated with the Project will use native species (see Section 6.13 for more information on landscaping).

6.6B.3.7.29 City of Morro Bay – LCP Policy 11.14

A minimum buffer strip along all streams shall be required as follows: (1) a minimum buffer strip of 100 feet in rural areas; (2) a minimum buffer strip of 50 feet in urban areas. If the applicant can demonstrate that the implementation of the minimum buffers on previously subdivided parcels would render the subdivided parcel unusable for its designated use, the buffer may be adjusted downward only to a point where the designated use can be accommodated, but in no case shall the buffer be reduced to less than 50 feet for rural areas and 25 feet for urban areas. Only when all other means to project modifications are found inadequate to provide for both the use and the larger minimum buffer. The lesser setback shall be established in consultation with U.S. fish and Wildlife and the California Department of Fish and Game and shall be accompanied by adequate mitigations. The buffer area shall be measured landward from the landward edge of riparian vegetation or from the top of the bank (e.g., in channelized streams). Maps and supplemental information may be required to determine these boundaries.

Adjustments to the minimum buffer must protect the biological productivity and water quality of the streams. Assessment of impact shall include, but not be limited to the following factors: (a) Soil type and stability of stream corridors; (b) How surface water filters into the ground; (c) Slope of land on either side of the stream; and (d) Location of the 100 year flood plain boundary.

Where riparian vegetation has been previously removed, except for stream channelization, the buffer shall allow for the re-establishment of riparian vegetation to its prior extent to the greatest degree possible.

Basis for Consistency

The Project will use a 25-foot buffer along the Morro Creek and Willow Camp Creek wetland and stream/riparian corridors. Existing MBPP structures and the Morro Creek temporary construction road bridge crossing do not allow for a 50-foot riparian buffer to be used. Duke Energy will work with the US Fish and Wildlife Service and the California Department of Fish and Game to determine if any mitigation measures are necessary.

6.6B.3.7.30 City of Morro Bay – LCP Policy 11.15

No structures shall be located within the stream corridor except: public trails located within a buffer when no alternative location is feasible but outside of riparian habitat; necessary water supply projects; flood control projects where no other method for protecting existing structures in the flood plain is feasible and where such protection is necessary for public safety or to protect existing development; and development where the primary function is the improvement of fish and wildlife habitat. Bridges (when support structures are located outside the critical habitat areas) may be permitted when no alternative route/location is feasible. All development shall incorporate the most protective mitigations feasible.

Basis for Consistency

The Project will build a bridge over Morro Creek to improve public access. There is not another feasible location for the bridge which has less environmental impact. The bridge will not have structures in critical habitat and will incorporate the most protective mitigations feasible. No other structures will be constructed in the wetland and stream/riparian corridor.

6.6B.3.7.31 City of Morro Bay – LCP Policy 11.16

All permitted development, including dredging, filling, and grading within stream beds and setback buffer areas shall be limited to activities necessary for the construction of uses specified in Policy 11.15. When such activities require removal of riparian plant species, revegetation with local native riparian species shall be subject to review and comment by U.S. Fish and Wildlife Service and the Department of Fish and Game.

Basis for Consistency

The Project will comply with the buffer zone requirements and maintain existing buffers. The bridge over Morro Creek is allowed in Policy 11.15. Native plants will be used for revegetation.

6.6B.3.7.32 City of Morro Bay – LCP Policy 11.17

The Biological productivity of the city's environmentally sensitive habitat areas shall be maintained and, where feasible, restored through maintenance and enhancement of the quality and quantity of Morro and Chorro groundwater basins and through prevention of interface with surface water flow. Stream flows adequate to maintain riparian and fisheries habitat shall be protected

Basis for Consistency

The Project will maintain Environmentally Sensitive Habitat and Morro groundwater basin. The Project will not impact the stream flow of Morro Creek or Willow Camp Creek. The grading plan requires that the MBPP Project drainage is away from Morro Creek and Willow Camp Creek.

6.6B.3.7.33 City of Morro Bay – LCP Policy 11.19

No vehicle traffic shall be permitted in wetlands and pedestrian traffic shall be regulated and incidental to the permitted uses. New development adjacent to wetlands shall not result in adverse impacts due to additional sediment, runoff, noise, and other disturbances.

Basis for Consistency

The Project will only allow limited pedestrian traffic in wetlands and stream/riparian habitats which shall be regulated and incidental to the permitted uses. The Project will not result in adverse impacts to Environmentally Sensitive Habitat or adjacent wetlands.

6.6B.3.7.34 City of Morro Bay – LCP Policy 11.20

Coastal dune habitats shall be preserved and protected from all but resource-dependent, scientific, educational and passive recreational use. Disturbance or destruction of any dune vegetation shall be prohibited, unless no feasible alternative exists, and then only if revegetation is made a condition of project approval. Such revegetation shall be with native plants propagated from the disturbed sites or from the same species at adjacent sites.

All non-authorized motor vehicles shall be prohibited in beach and dune areas. A buffer strip, a minimum of 50 feet in width in urban areas, and 100 feet in non-urban areas shall be maintained between the dune habitat and adjacent development. All permitted uses shall be regulated and restrictions enforced to protect critical bird habitats during breeding and nesting seasons. Controls may include restriction of access, noise abatement, restriction of hours of operations of public or private facilities. For all permitted uses within dune habitat areas, including recreation, foot traffic on vegetated dunes shall be minimized. Where access through dunes is necessary or established through historical public use, well-defined footpaths or boardwalks shall be developed and used.

Basis for Consistency

The Project will not disturb dune (dune scrub) habitat when building the temporary construction road or bike/pedestrian path. The least disruptive location for the construction road has been chosen through grasslands and an existing dirt roadway avoiding dune scrub habitat. An existing dirt alignment will be used for the construction road and bike/pedestrian path. Motorized vehicles will be confined to the construction road for the Project. A qualified biologist will assist in staking of the road alignment to ensure that no dune habitat will be impacted by the temporary construction road/path alignments. The Project will maintain the existing buffer zones for dune habitat (see Figure 6.6B-5).

6.6B.3.7.35 City of Morro Bay – LCP Policy 11.22

The precise location and thus boundary line of Environmentally Sensitive Habitat areas shall be determined based upon a field study paid for by the applicants and performed by the City or City's consultants and approved by City council and/or their appointed designee prior to the approval of development on the site, including, but not limited to, a division of land, provision of public access, or restoration of the ESH.

Basis for Consistency

This AFC delineates the exact boundaries of Environmentally Sensitive Habitat (see Figure 6.6B-5) and the Project complies with applicable requirements to protect sensitive habitats.

6.6B.3.7.36 City of Morro Bay – LCP Policy 11.23

As a condition of approval of development prior to commencement of any development, property owners/applicants shall dedicate appropriate permanent easement over portions of the property determined to be sensitive habitat, such as dunes, beach, wetlands, or stream/riparian corridor.

Basis for Consistency

The Project will provide a conservation easement over the Environmentally Sensitive Habitat that is a part of the existing MBPP site.

6.6B.3.7.37 City of Morro Bay – MC 17.40.040(C)

C. Uses Allowed Only with a Conditional Use Permit

1. Wetlands: The following are conditionally permitted uses in wetlands: road and bridge replacements, very minor, incidental public facilities when there is no other feasible, environmentally less-damaging alternative; other scientific and education work; restorative measures; and commercial mariculture where no alteration of the wetland is necessary.

3. Sand Dunes, Sandspits: The following are conditionally permitted uses: road and bridge replacements, incidental public facilities such as buried cables or pipelines where there is no other feasible, less environmentally damaging alternative and where feasible mitigation measures have been provided to minimize adverse environmental effect.

4. Stream Corridors: The following are conditionally permitted uses: controlled public access including public trails within the buffer; necessary pipelines and water supply projects where no alternative location exists; flood control projects where no other method for protecting existing structures in the floodplain is feasible and where such protection is necessary for public safety or to protect existing development; road and bridges where no alternative route/location is feasible and if support structures are not sited in the environmentally sensitive habitat.

Basis for Consistency

The Commission's certification permit will subsume the need for a conditional use permit from the City of Morro Bay. The Project will not impact surrounding wetlands and stream/riparian habitats within the Morro Creek and Willow Camp Creek stream corridors. The Project will not disturb dune (dune scrub) habitat when building the construction road or bike/pedestrian path The least disruptive location for the construction road has been chosen through grasslands and an existing dirt roadway to avoid dune habitat.

6.6B.3.7.38 City of Morro Bay – MC 17.40.040(D.3, 6, 7)

D. Special ESH Zone Standards

3. Buffers required, general

a. Wetlands: The minimum buffer surrounding wetlands shall be one hundred (100) feet. Review area: minim of two hundred fifty (250) feet.

b. Streams: The minimum buffer for streams shall be one hundred feet (100) in non urban areas and fifty feet (50) in urban areas.

c. Sand Dunes: The minimum buffer for sand dunes shall be one hundred (100) feet, in non urban areas and fifty (50) feet in urban areas.

6. Reducing buffers

a. In all cases, except for wetlands, buffers may be reduced in accordance with the following standards if the application of the buffer specified in Section 17.40.040.D.4 on a previously subdivided parcel would render that subdivided parcel unusable for its designated use.

b. Accommodation of designated use: Buffers may be reduced only to the point where the designated use is accommodated but in no case shall it be less than fifty (50) percent of the width called for in Section 17.40.040.D.4. Said reduction in setbacks may be permitted by the City, as provided above, only after consultation with the California Department of Fish and Game; the applicant shall implement as part of the development all mitigation measures deemed necessary for habitat protection after such consultation. All permitted reductions in buffer areas shall be found consistent with Policies 11.01, 11.05, 11.06, and 11.14 of the Coastal Land Use Plan. (Ord. 263 § 1 (part), 1984).

7. Uses in buffer area

a. General: The uses permitted in buffers shall generally be limited to those permitted in the adjacent habitat area.

Permanent structures: no permanent structures shall be permitted within buffer areas except for those of a minor nature such as: (2) in other districts: a) at grade improvements for pedestrian or equestrian trails; b) instructional or informational signs; c) designated observation areas, or other public access or educational facilities; d) fences; e) eaves. Applications for all such improvements shall be submitted to the department of fish and game for review and comment before the issuance of a coastal development permit. (Ord. 263 § 1 (part), 1984)

Basis for Consistency

The Project will use appropriate buffers; no permanent structures will be located in the buffer zones. The Project may need to reinforce the existing flood control berms. The Project will construct a mitigating sound wall on top of the northern berm that will reduce noise and visual impacts (movement) to wildlife species which may utilize the Environmentally Sensitive Habitat.

6.6B.3.7.39 City of Morro Bay – MC 17.40.040 (D.8)

D. Special ESH Zone Standards

8. Subdivisions prohibited: The further subdivision of any ESH area shall be prohibited except where the sensitive habitat area is to be transferred in fee to a public agency for a wildlife refuge or for a wildlife management area. (Ord. 263 § 1 (part), 1984)

Basis for Consistency

The Project will not subdivide any sensitive habitat.

6.6B.3.7.40 City of Morro Bay – MC 17.40.040 (D.9)

D. Special ESH Zone Standards

9. Performance Standards: All other sections of this Chapter notwithstanding, no uses shall be permitted unless the following performance standards are met, as applicable, in new developments:

a. Significant Adverse Effects: New development shall not result in significant adverse effects upon habitat values.

b. Revegetation: Where permitted uses require the removal of riparian or dune related plant species, such removal shall be limited to the minimum amount necessary and revegetation with (1) native vegetation in the habitat areas of rare or endangered species, or (2) native, drought-tolerant plants where determined feasible and approved by the City. All such proposals calling for removal of vegetation and subsequent revegetation shall be submitted to the Department of Fish and Game for review and comment.

c. Walkways, Trails and Similar Uses: Walkways, bicycle trails, overlooks and other structures for nature study and passive recreational use shall be designed to minimize the disturbance of wildlife and vegetation. For example, in dune areas elevated walkways may be required.

g. Other Agency Permits: Prior to any construction, alteration or other improvement in areas designated as wetlands or estuaries the following shall be presented to the City: (1) 404 Permit: A Section 404 permit (or its equivalent successor) from the U.S. Army Corps of Engineers. (2) Letter from CDFG: A letter from the California State Department of Fish and Game stating compliance with Section 1601 and 1603 (or their equivalent successors) of the State Fish and Game Code. (Ord. 263 § 1 (part), 1984)

Basis for Consistency

The Project will comply with applicable performance standards required for Environmentally Sensitive Habitat. No significant adverse impacts will be created by the Project. Revegetation will be with native species. The Project includes creating and improving bike/pedestrian paths around the plant and a bridge over Morro Creek to improve public access while minimizing impact to the environment. The Project does not include construction in dune (dune scrub), wetland, estuarine, or stream/riparian habitats and therefore does not need to obtain a Section 404 Clean Water Act permit from the U.S. Army Corps of Engineers or a Section 1603 Stream Bed Alteration Agreement from the CDFG. A Section 9 of the Rivers and Harbors Act authorization, from the U.S. Coast Guard, will be required for the Morro Creek bridge crossing.

The CDFG will participate in the Commission's AFC review process and ensure compliance with Sections 1601 and 1603 of the State Fish and Game Code and the California Environmental Quality Act (CEQA). The U.S. Fish and Wildlife Service and National Marine Fisheries Service will participate in the Commission's AFC review process and ensure compliance with the Endangered Species Act.

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